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Queensland Agricultural Journal

Vol. V. JANUARY, 1916. Part 1.

Agriculture.

THE NATIONAL AGRICULTURAL AND INDUSTRIAL ASSOCIATION OF QUEENSLAND.

Fixed for from 14th to 19th August inclusive.

At a meeting of the Council of the National Association, held in December last, business was confined to the revision of the prize schedule for the 1916 show, and, from a perusal of the alterations made, the schedule promises very distinct improvement in a number of sections.

It was mentioned by several members of Council that, owing to the occupation of the show grounds by the military authorities, a rumour was current to the effect that no show would be held next year. The work dealt with by the Council at the meeting emphatically refutes this rumour, and provides ample evidence that every effort is being made to make next year's show equal to best previous efforts.

Already two districts have notified their intention of sending district exhibits to the next show, and similar notice has been received from two

one-man farm exhibitors and one one-woman's work exhibitor. Several breeders of stud cattle in dry areas are known to be keeping their cattle in show condition, this being quite apart from the large number of exhibitors in the more favoured districts who have expressed their intention of bringing good representatives of their studs to Brisbane next August.

A suggestion has been submitted from fruit-growers in districts which have not hitherto participated in district fruit displays, which it is claimed will result in one of the most versatile and positively the largest display of Queensland fruits ever staged under one roof. The suggestion, if adopted, will result in a display of fruit of variety and quality not hitherto seen in a Brisbane show. Growers who have been interviewed are enthusiastic with regard to the proposal.

It is anticipated that one of the leading features of next year's show will be an exhibit of extraordinary interest at the present juncture—viz., an exhibit of goods manufactured in Queensland. Many Queenslanders have small conception of what is manufactured in their midst, and at the coming show a strong effort will be made to advertise the State's capabilities. Extra interest will be added to this section by introducing machinery at work on the actual manufacture of the goods, which will be shown from the rawest up to the finishing stages.

The next annual show will be held on from 14th to 19th August, 1916, inclusive.

THE SINEWS OF WAR—GRAIN PRODUCTION.

Whilst Queensland cannot approach the three great wheat-producing States of the Commonwealth in the production of that cereal, she can surpass them in the production of maize; and, with the help of up-to-date machinery for cultivation and for husking and shelling, the cost of growing and preparing this crop for market has been considerably reduced of late years. The following estimate of the cost of growing, harvesting, and marketing a 150-acre crop of maize was furnished to us by a large grower on the Darling Downs. He prepared these statistics carefully and reasonably from a practical man's standpoint, and as he found them under practical conditions. His results are as here given:—

MAIZE FOR GRAIN.	£	s.	d.
150 acres maize—ploughing, at 8s. per acre	60	0	0
150 acres—second ploughing, at 5s. per acre	37	10	0
Cultivating 150 acres, at 3s. per acre	30	0	0
Harrowing 150 acres, at 2s. 6d. per acre	18	15	0
Scuffling 150 acres twice, at 4s. per acre	30	0	0
Pulling or stacking crop, at 7s. per acre	52	10	0
2,000 sacks, at 6d.	50	0	0
Carting 2,000 sacks to railway—4 miles, at 6d. ..	50	0	0
Threshing 2,000 bags, at 6d.*	50	0	0
	£378	15	0

or about £2 10s. 8d. per acre, exclusive of interest.

* Since this estimate was compiled, the cost of production, of farm machinery, and jute goods (bags) has risen considerably.

With a crop yielding 40 bushels per acre, or 6,000 bushels at 3s. per bushel, the return is £900, leaving a net profit of £521 5s., or £3 9s. 8d. per acre.

So far as value per acre is concerned, much greater profits have been made in Queensland from the rich soils of the vast corn-belt of the State. If we take 4s. per bushel as the present price of maize, instead of 3s., the return amounts to £1,200 from the 150 acres, leaving a net profit of £821 5s., or £5 9s. 6d. per acre.

There are times in the history of all countries, especially in Europe during the progress of protracted war, when a golden opportunity presents itself to the producers of cereal crops, as well as to cattle, sheep, and horse breeders and others on the land. We wish to point out to these that the production of food supplies of all kinds for the many millions of the inhabitants of Europe cannot but be largely restricted by the devastation of the agricultural lands of those countries—the inability to put sufficient land under cultivation for the feeding of non-combatants alone. How, then, must the case stand when we consider the needs of the many millions of men constituting the armies of the belligerents now engaged in the present gigantic war, and that these have to be provided for to an enormous extent from the land?

It is a trite saying that "An army marches on its stomach"; but it is as true to-day as it was in the days of the Romans, the Carthagenians, the Persians, Gauls, Huns, and Goths, and all the old-world nations which were continually at war with each other. The great demand was for cereal foods rather than animal provisions, although cattle were also in great demand, as were also milk and cheese: These for the armies in the field and besieged cities, as well as for those in countries not overrun and devastated by hordes of invaders. But, besides these, there are, and were, tens of thousands of horses to be fed, and other thousands to be obtained to supply the places of those killed in battle. Whence are the supplies of these to be derived? Neither France, Germany, Austria, Russia, Belgium, Italy, Denmark, Holland, nor Great Britain can supply more than a fraction either of cavalry, artillery, or draught animals, or of the imperative demand for the products of agriculture.

To what countries can, then, the belligerents look for supplies, unless it is from those which are remote from the various theatres of war, as, for instance, the Australian Commonwealth, New Zealand, Canada, the South African Union, Java, or some of the South American Republics?

From none of these could Germany or Austria or Bulgaria be supplied for obvious reasons. The opportunity for the farmers of the Australian Commonwealth and New Zealand is one which should be taken advantage of, both for patriotic and individual reasons. For patriotic reasons, all who own or rent suitable lands should strain every nerve to bring as much of it as possible under grain cultivation. The season for maize-planting extends to, say, January; and, in view of the partial failure of the wheat harvest, owing to the disastrous drought of 1915, there are large areas which could now be planted with maize. We note that, since the fairly bountiful rains which fell at the end of

November, many farmers are planting up their wheat lands with maize, which, in November last, was bringing up to 5s. 4d. per bushel; and the Department of Agriculture and Stock has been supplying intending growers with the most prolific varieties at a price which has resulted in a great demand, and, given a good season, the returns from this late crop may, it is hoped, recoup the growers for some of their losses on the wheat crop from which such excellent results had been anticipated.

The area under cultivation in Queensland in 1914-1915 on 24,553 cultivated holdings was 981,218 acres; and the value of the grain crops was £1,115,982, and of all crops £5,679,783. The return of wheat for grain was 1,585,087 bushels, and for maize 4,260,673 bushels.

In farming, exclusive of dairying, there were employed 34,686 males and 1,441 females, of whom there were 22,048 land-owners farming from 5 to 50 acres and upwards. Dairying employed 13,805 males and 12,774 females.

A member of Parliament, in a letter to one of the daily newspapers lately, emphasised the probability of a heavy demand for foodstuffs of all descriptions, and he urged that farmers throughout Queensland should make an effort to plant a much larger area than usual. It was his opinion that farmers cannot better assist Great Britain to come out victorious from the war than by the production of great quantities of foodstuffs such as may now be planted. This increase of land under cultivation could easily be accomplished by hundreds of farmers, especially in the direction of maize and millets, and, early in the autumn, of wheat.

To emphasise the preceding remarks on the necessity for a substantial increase in the production of foodstuffs, let us take the number of cavalry horses employed by both sides in a great battle as 1 to 10 as compared with infantry. At the battle of Borodino, in 1812, there were 70,000 cavalry; and in 1913, at the battle of Leipzig, 78,000 cavalry were engaged on both sides. A modern army of 500,000 men would require 50,000 cavalry horses, besides an enormous number for transport, field artillery, mounted infantry, ambulance, &c. All these require to be fed and well fed.

The full war allowances daily are:—

Transport—maize, 18 lb.; lucerne chaff, 12 lb.
Cavalry—maize, 12 lb.; lucerne chaff, 14 lb.
Field artillery—maize, 16 lb.; lucerne chaff, 11 lb.
Mounted infantry—maize, 10 lb.; lucerne chaff, 12 lb.

Where oats are used, the allowance of grain may be 10 per cent. less. Where maize is used exclusively as grain, the chaff should be mainly lucerne. If other chaff has to be used, part of the grain ration should be oats. The harder and more prolonged the work, the more the grain ration should be increased in proportion to the chaff.

As a further illustration of the need for increased grain production, take the daily rations for 100,000 horses with the maize ration at 14 lb. and the lucerne at 12 lb. for each horse. The maize alone would amount to 25,000 bushels and the lucerne chaff to over 53 tons. Allowing 4s.

per bushel for maize, and £10 per ton for lucerne chaff (which is now at £10 to £12 per ton), the daily cost will reach £5,000 for maize and £530 for chaff. It will thus easily be understood what an enormous quantity of two of our principal farm products would be needed during a war extending over two years.

As a Brisbane newspaper says:—"Our own kith and kin in Great Britain, upon whom the brunt and heaviest burden of Empire defence must inevitably fall, will suffer more than anyone if food becomes scarce; therefore every loyal farmer in Queensland should set his energy and skill, his land and his stock, to the task of producing food in the greatest abundance. Preparations should be made strenuously to extend the areas under pasture, fodder, and cereals. Now is the time for them to hustle. No one wants to see famine prices among our own people, but we must naturally expect high prices, and there is not a single one of the long list of our exportable foodstuffs which cannot be sold at a satisfactory profit. It is a little over forty years ago, when the German armies overran France, conquered its armies, plundered its capital, and placed the nation under an enormous war indemnity. Germany thought France was crushed and ruined, so Bismarck believed—so he intended. It was impossible, so Europe believed, for France to pay off the burdens under many, many years. If the French farmer had been a moral weakling or a coward, France would have been ruined; but the farmer set to work on his blackened fields and his trampled vineyards, and in two years France was as prosperous as ever, and had paid out the last soldier of the German army of occupation. If Queenslanders will only do as much as the Frenchmen did after they were a defeated people, there is no reason why this State should suffer financial loss. There is rather reason for saying, it can make itself stronger and richer than ever it was before."

To return to the suggestion that our farmers would be patriotic enough to strain every nerve to increase the area of their plantings with a view to a large export of foodstuffs for not only our own troops in the field, but also for our gallant allies. If, say, 10,000 of them were to plant an extra 10 or 20 acres of corn, given good climatological conditions, the result would be (even with an average of only 30 bushels per acre) 3,000,000 to 6,000,000 bushels of grain in addition to the normal crop of 4,000,000 bushels. Those additional 6,000,000 bushels would feed 100,000 horses for 240 days.

Then take lucerne, of which some 47,785 acres are planted. This area yielded, in 1914-15, 71,252 tons of hay, or over 1½ tons per acre.

Does not this show how, by a little extra exertion, the Queensland farmers could do a very great deal to minimise the almost certain scarcity of fodder in the armies of the allies?

Now is the time for the farmer to show that his patriotism does not begin and end with patriotic songs, &c. If he takes the sensible view of the situation and acts promptly, he will not only be contributing largely to the welfare of our troops at the seats of war, but also will, to some considerable extent, benefit himself by the certain increase in prices for his produce.

COMPLETE FERTILISERS FOR FARM, ORCHARD, AND VEGETABLE GARDEN.

ORANGES.

An artificial mixed fertiliser, containing 8 per cent. of nitrogen, in form of inorganic nitrogen, 4 per cent. water soluble phosphoric acid and 8 per cent. of potash, should be applied at the rate of 4 to 16 lb. per tree, in accordance with its age.

Any of the mixtures recommended for the manuring of lemons may be used, or the following may be found more suitable for oranges:—

2 to 6 lb. of superphosphate
1 to 2 lb. sulphate of potash
1 to 3 lb. nitrolim or sulphate of ammonia
} per tree;

or,

2 to 4 lb. bonedust
1 to 3 lb. superphosphate
1 to 2 lb. sulphate of potash
2 to 4 lb. nitrate of lime, or nitrate of soda
} per tree.

PASSION FRUIT.

This semi-tropical fruit thrives best on a warm, free loamy soil, but may be grown on poorer soils, with the aid of artificial fertilisers.

Use in accordance with the quality of the soil, a mixture of—

4 to 8 cwt. blood and bone manure
1 to 2 cwt. superphosphates
1 to 2 cwt. sulphate of potash
} per acre.

A topdressing with 1 cwt. of nitrate of lime or nitrate of soda in spring will be found beneficial.

PAPAW (PAWPAW).

This tree requires a well-drained soil, and does best on a good scrub soil all along our coast, in situations free from frost.

Apply, per acre, a mixture of—

2 cwt. bonedust
1 cwt. superphosphate
1 cwt. sulphate of potash
1 cwt. nitrolim or nitrate of soda,

or 1 to 2 lb. of this mixture per tree.

PEACHES.

Peaches may be grown over a considerable part of our coastal and inland country, on almost any soil, from a light sandy loam to a heavy loam, with a clayey subsoil.

Apply, per tree, in accordance with its age—

½ to 3 lb. superphosphate;
½ to 1½ lb. sulphate of potash;
¼ to 1 lb. nitrolim or sulphate of ammonia.

giving young trees, not bearing, about 1 lb. of the mixture, and large trees in full bearing up to 6 lb.

PEARS.

This tree prefers a deep loamy soil, but does well on lighter soils. The manures recommended for apple trees should be used for this fruit also.

A good fertiliser for pear trees, grown on our sandy soils of average quality, would be—

1½ lb. bonemeal	per tree.
1½ lb. superphosphate	
1 lb. sulphate of potash	
1 lb. nitrolim	

This quantity is for young trees; for large trees over eight years old the quantity can be about doubled.

PERSIMMONS (DATE PLUMS).

This fruit may be grown in any fruit soil, and does well in our coastal districts south of the Tropic of Capricorn.

To trees in full bearing apply every year—

2 lb. superphosphate	per tree.
1 lb. sulphate of potash	
¾ lb. nitrolim or sulphate of ammonia	

PINEAPPLES.

Pineapples are being grown in almost any kind of soil, all along our eastern seaboard. The most suitable soil is a light, well-drained, sandy loam. Even in rather poor sandy soils, pineapples may be grown profitably with the aid of artificial fertilisers. All soils should contain a fair amount of humus and a sufficient quantity of lime. Soils inclined to become acid, due to defective drainage, are not suitable. All manuring experiments show the necessity of an ample supply of potash, and also that nitrogen is best applied in form of organic nitrogen (dried blood giving the best results).

Many old pineapple plantations would be greatly benefited by a heavy dressing of lime; air-slaked quick lime to be used in case of clayey soils, and carbonate of lime (shell sand, marble screenings, &c.) for sandy soils.

A mixed fertiliser containing from 6 to 8 per cent. phosphoric acid, 8 to 10 per cent. of potash and 4 to 5 per cent. of nitrogen should be used at the rate of 6 to 15 cwt. per acre, according to the quality of land and age of the plantation. The manure should be applied in two dressings, and well dug, chipped, or ploughed in as near to the rows as possible.

The following fertiliser mixtures may also be used with advantage:—

5 cwt. meatworks manure (blood and bone)	per acre;
3 cwt. Thomas phosphate	
3 cwt. sulphate of potash	
1 cwt. dried blood or nitrate of lime or nitrate of soda	

for very young plantations the quantities to be reduced by one-half, and for very old plants the quantities to be increased.

PLUMS.

Plums may be grown in our coastal districts and also in the Western country, on sandy loams and gravelly soils, with clayey subsoils.

Apply to a young tree in full bearing—

2 lb. superphosphate
1 lb. sulphate of potash
¾ lb. sulphate of ammonia or nitrolim } per tree.

For a very young tree the application can be cut down to one-half of these quantities, and for very large old trees the amount can be safely doubled.

QUINCE.

The fertilisers recommended for apples may be used for quinces.

STRAWBERRIES.

Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked.

A complete fertiliser for strawberries should contain 7 to 8 per cent. phosphoric acid (water soluble), 8 to 10 per cent. of potash and 3 per cent. of nitrogen, and should be used at the rate of 5 to 9 cwt. per acre.

The following fertiliser mixture may be found useful:—

3 to 5 cwt. superphosphate
1½ to 2 cwt. sulphate of potash
1 to 1½ cwt. sulphate of ammonia or nitrolim } per acre;

or,

1 cwt. fine bonemeal
4 cwt. superphosphate
2 cwt. sulphate of potash
1½ cwt. nitrolim or nitrate of soda } per acre.

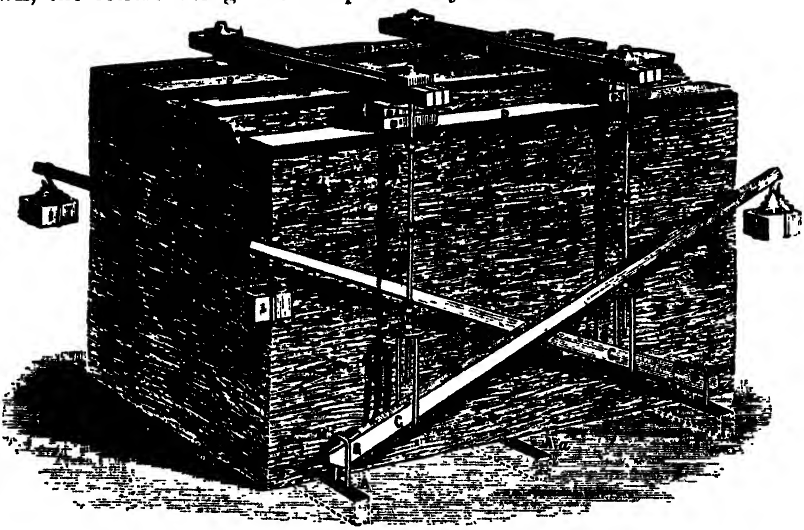
STACK ENSILAGE.

TO START THE STACK.

Lay a foundation of logs on the outside of the space to be occupied by the fodder, and fill in between with broken stones and gravel. Then place a layer of straw over the gravel. This will raise the foundation about 1 ft. from the surface of the ground, and allow all surplus moisture to run away. Now, place a layer of oats (or of whatever material is to be used for ensilage), 10 ft. deep, on the straw. Stop operations for a day to allow the forage to settle down. Continue in this way until the stack has reached the desired height. Lay all the butt-ends outwards, and make the stack as square and solid, and plumb on the outside, as possible, by which means the greatest pressure is produced, and the air is more effectually kept out.

When the stack is finished, put a load of straw on the top with a couple of wires weighted with stones to keep the straw from blowing off. No artificial pressure (*i.e.*, pressure by mechanical means) of any kind is needed. In a very rainy season, some covering, in addition to the straw, would be advisable. The smallest-sized stack which is allowable is one 10 ft. by 10 ft., holding 20 tons. The smaller the stack, the greater the waste at the sides. A stack 16 ft. by 16 ft. will contain 100 tons; 1 ton of green oats will make 1 ton of silage, of which, 1 cubic foot will weigh 45 lb.

From the first load to the completion of the stack, the greatest attention should be paid to the outside edges. This is a very important point. The outsides should always be kept higher than the centre when stacking, and should be made much more compact by being well trodden down, the centre being left comparatively loose.



When finished, the top should be levelled and covered with a layer of straw, pressure being then applied by piling the handiest material procurable on the top, so that a dead weight of about 1 cwt. per square foot is obtained.

TEMPERATURE.

The whole art of making silage depends chiefly on temperature, and the amount of pressure applied.

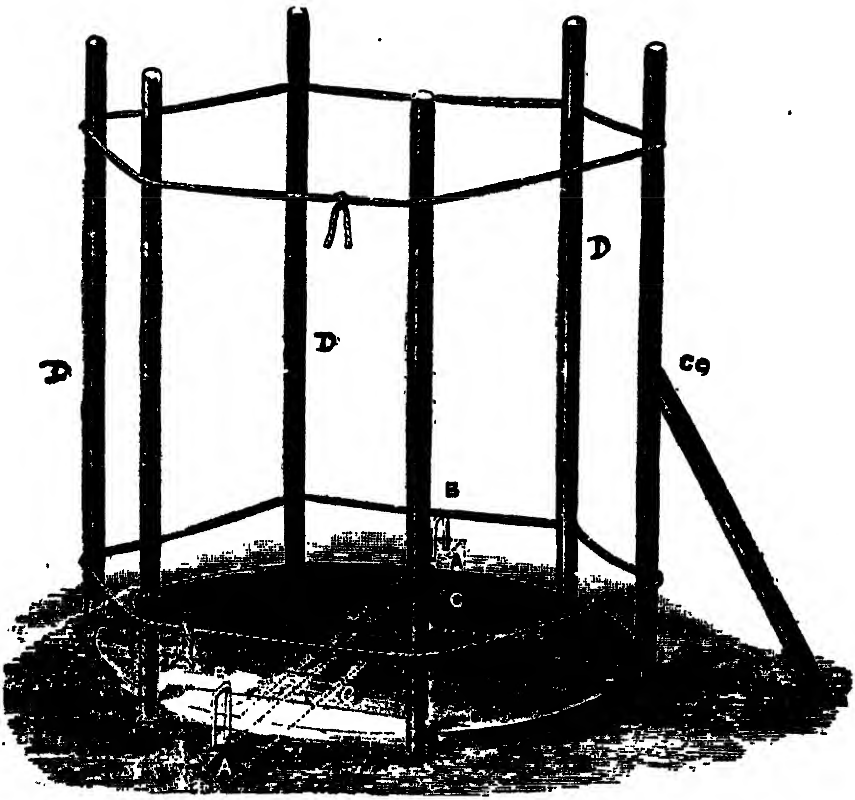
If heavy pressure is at once applied, the air is excluded, and the temperature does not rise above 120 degrees Fahr. This results in sour silage. To produce sweet silage, the mass must not be weighed to any great extent before the temperature has reached from 130 degrees to 150 degrees. Care must be taken not to allow the temperature to rise above 160 degrees Fahr., or the stack will become overheated and burnt. An ordinary floating dairy thermometer is the most convenient to use. An iron pipe of slightly larger diameter than the thermometer is built into the middle of the stack in a vertical position. The thermometer can then be lowered by a string, and the temperature taken at any depth.

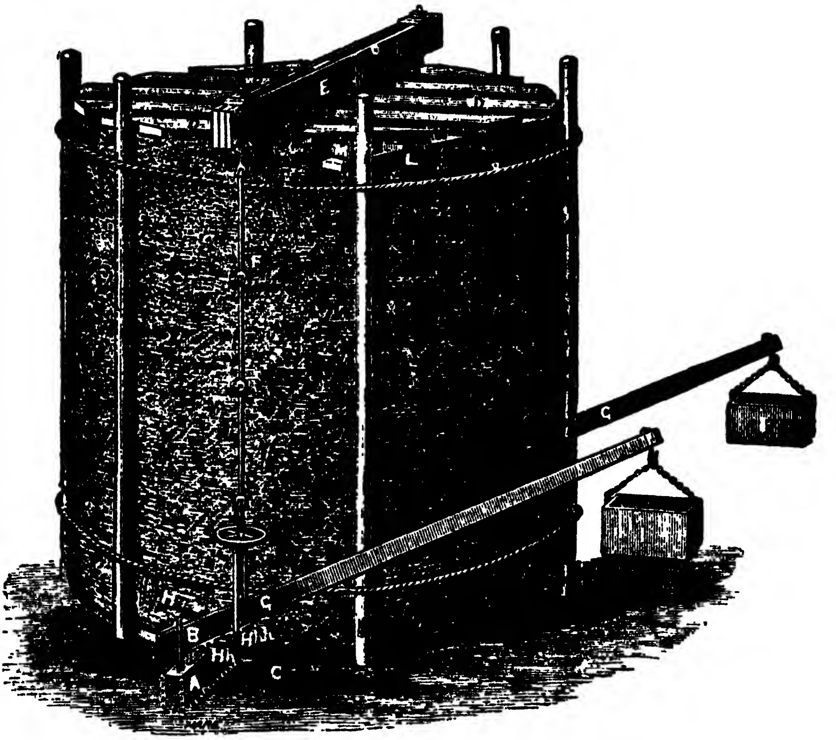
THE ADVANTAGES OF THE STACK SYSTEM.

The stack system is by far the cheapest method to follow, notwithstanding the slight loss which must invariably occur at the outer edges. It is certainly, however, not superior to built or pit silos; but little expenditure is needed, and the stack may be erected in the paddock where the crop is grown. By this a great saving in cartage may be secured. It is also easier to make sweet silage in stack form than by the use of rigid silos. A stack also has an unlimited capacity, as it can be made of any size suitable to the quantity of fodder grown. There is also less waste in the larger stacks, owing to the fact that the larger the stack the less exposed surface in proportion to the mass.

ROUND OR OBLONG SILAGE STACKS.

As far as stacks are concerned, they may be of various shapes and sizes. A round stack has a much less percentage of waste than any other shape, and is more easily kept upright. A square or oblong stack measuring 300 superficial feet will have about 70 ft. round the sides. A round stack measuring 300 superficial feet, has only about 60 ft. of outsides, equal to a saving of about 14 per cent. Besides this, there is always considerable loss at the corners of the square or oblong stack, which is entirely saved in the round one. A round stack, 20 ft. in diameter and 15 ft. high, contains about 100 tons of silage. The accompanying figures show how to commence the stack, and its finished form:—





A CHEAP SILAGE MATERIAL.

By ARTHUR JONES, Bondoola, Yeppoon.

The season now passing shows the necessity of providing stock fodder in favourable seasons to carry over unfavourable ones.

Silage has proved the best method of conserving cattle fodder, producing a greater quantity of a more succulent quality than by other methods.

Proper air-tight silos are the best, but good silage can be made in stack form, placed between posts, following the description given in your Journal a short time ago. With stack silage there is always a certain quantity of waste, but with the material now brought to your notice this is of little importance.

I had an 18-acre field of maize, with stalks of the normal size and height, but only a light crop of cobs on part of it. We decided to pull the maize when it was mature, and stack the stalks for silage. Owing to pressure of other work, the erection of the posts was delayed until the maize was fully ripe, when the leaves had dried, and only the stem had any tinge of green; so it was very doubtful whether silage or manure would be the result. A stoppage occurred for a few days when the stack was half finished, and then all doubts were dispelled by the pleasant smell of ferment which came from the stack. On opening it several months

later, the contents proved to be in first-class condition, making a good silage. A few showers fell and a part of the material was damp when it was stacked.

The chief points to note are that the full crop of maize was obtained, and the waste material, which is usually burnt, was turned into a valuable cattle fodder, at a very little cost, and in large quantities. If to this were added, in alternate layers, either lucerne. cowpea, or beans, or any of the legumes, the mixture would provide a well-balanced ration for cattle, even of the legumes formed only a small proportion of the bulk. If these legumes are not green or succulent, or if they are not available, water added to the stalks as they are laid on the stack would help the fermentation.

Another important feature is that the dung from this silage, if returned to the soil, would enrich it by returning nearly all of the potash and phosphates removed by the crop from the soil, and would also return the nitrogen, the most expensive of manures, which is wholly lost in smoke by the usual practice of burning the dry stalks. These substances are returned in a much better form, for the plant roots to avail themselves of, than if the stalks had been ploughed in, which is so unsatisfactory that it is never done.

This dung supplies humus in quantity, making the soil mellow, and it also acts as a sponge, absorbing excessive moisture, and retaining it to supply the plant roots with moisture in dry periods.

By this method the land is clean and ready for the next crop, which partly compensates for the cost of cutting the stalks.

The posts were erected as described, but, in filling, we erected a pair of shear-legs, 35 ft. high, at the one end of the stack, sinking the legs in a hole 8 in. deep to prevent slipping. Two guys were attached to the top—one to connect with one of the stack posts at the furthest end, within reach of the man on the stack; and the other guy was fastened securely to a stump, post, or tree in the opposite direction with just sufficient slack to allow the shear-leg to swing the bundle of stalks well on to the stack. By this means we unloaded a two-horse dray load in two hauls. The tackling needed is a set of treble and double blocks, also a snatch block with sufficient length of rope. The treble block is slung close to the top of the shear-legs, and the fall of the rope is passed through the snatch block, and a loop is tied on its end, into which the hooks of the chains of the leading horse are placed. In loading, a trace chain is stretched across the bottom of the dray near the middle, with one end of the chain up over the guard rail and the other end over the opposite rail. When half of the load is on, another trace chain is stretched across it, also across the middle, and the other half of the load is placed above this. Four uprights of about 5 ft. long were placed at each corner of the dray to hold the stalks on. The loaded dray was backed between the shear-legs, and a wire rope about 6 ft. long, with a ring spliced to one end and a hook (made to grab over the trace chain), spliced on the other; also, a small pulley block with a grab hook to engage with the other end of the trace chain.

The grab-hook end of the wire rope was first passed through the small pulley block, and the block was hooked to one end of the chain as low down as possible, and the grab-hook end of the wire rope passed across the load and hooked low down on the chain. Then the double pulley of the hoist is hooked into the ring, and the horse, when everything is clear, is started and half the load is lifted. The shear-legs should have just a slight lean away from the stack at the lift, and the man on the stack should pull the top over at the right time to swing the half load clear on to the stack. When it is at the height to clear everything, the sling chains are removed and the stuff stacked; the shear-legs are pulled over, and the block, hooks, and wire rope are fixed to the other trace chain in the same way, when the other half of the load is lifted on to the stack. The unloading is done in a few minutes when the men are used to the work; the stacking takes the longest time.

FETERITA.

Feterita is, primarily, a grain sorghum crop, a dry weather crop, and a short season crop. The strain of feterita that we now have was first grown in the United States in 1906, being imported to this country by the United States Department of Agriculture, and coming from the Sudan Valley of Africa. Grown on the United States Forage Crop Testing Station at Chillicothe, Texas, it has done fairly well every year since it was first introduced, but in the dry seasons of 1909 and 1911 it did exceptionally well. It has been grown at the experiment stations of this State since 1910; and during the last two years has been widely distributed throughout the State. During the season just past (1914) there was approximately 139,000 acres of feterita grown in Kansas, the largest acreage, for the most part, being in South-western Kansas, and that is the part of the State where it is best adapted.

It is admitted that the plant branches badly from the upper joints and stem if moisture conditions are favourable during the latter part of its growth. Feterita grain shatters more readily than either kafir or milo. The seed is soft and takes up moisture readily, and when planted in cold ground it rots instead of germinating. The seed heats more readily in the bin than that of any of the other sorghums. The seed head is quite heavy and is borne on rather a light stalk, and if the ground is wet and the wind high the plant lodges badly, and is difficult to harvest.

However, in spite of these disadvantages, feterita has many worthy features which will make it one of the most important grain sorghums in this State. Under average conditions, it will ripen from three days to a week earlier than Dwarf Milo, and often one month earlier than Standard Blackhull White Kafir. This habit means that in many cases it may escape drought and mature a profitable crop when kafir and even milo suffer severely. Feterita leaves remain green and cling to the stalk until the grain is thoroughly mature—the same as kafir—instead of drying up and falling off as do the leaves of milo. This means that

feterita is much more valuable as a forage crop than milo. However, it is not as valuable from the forage standpoint as a good quality of kafir in the central part of the State; but in the western part of the State, where it is possible to mature only the smaller and quicker ripening strains of kafir such as the Dwarf Blackhull, feterita will in many cases produce a greater tonnage of forage than kafir. The stalk of feterita is semi-juicy, and just before ripening it is slightly sweet. This characteristic, together with its ability to withstand drought and produce on poor soils, makes it worthy of more extensive use throughout Western Kansas or similar countries. It should not be grown as the principal sorghum crop in the Eastern half of Kansas except on soils that are extremely thin or underlaid with shale or some other substance which results in their being a droughty nature.

The methods of seed selection, gathering, and storing of feterita grain are the same as for any sorghum, with the exception that the glumes of the feterita are more open than of most other varieties of sorghum, which means that the seed crosses with neighbouring varieties more easily, and seed selection should be made at a considerable distance from other varieties. Much care is necessary to prevent the seed from heating in the bin.

The yields per acre at the State substation, Lubbock, Tex., for 1912 are as follows:—

	Bushels.
Feterita	57·71
Blackhull Kafir	43·96
White Milo	42·40

The forage value of feterita is at least equal to and probably superior to milo. For strictly forage purposes, however, it is excelled both by kafir and the sweet sorghums. The heavy proportion of grain makes it a very efficient feed for horses, cattle, and sheep. It also makes a good roughage when fed in conjunction with concentrates for fattening. Like the other sorghums, feterita is not particularly efficient as a milk-producer. For use as silage, feterita will probably be found equal to any other sorghum. The grain itself is undoubtedly comparable to milo or kafir, 10 bushels of it being equal to 9 or more bushels of shelled maize in feeding value. Whether the softer grain of feterita is an additional advantage in feeding remains to be determined. The seed coats apparently contain no tannin.

LUCERNE SEED.

Well-ripened samples of both clover and lucerne seed contain a certain proportion (varying from 5 to as high as 52 per cent.) of what are technically called hard seeds. These hard seeds have an outer shell which is impervious to moisture, and, after sowing, they remain in the ground unaffected by the influences which cause seeds to germinate, and are thus lost to the sower. It is the custom of botanical experts, when testing the germination of lucerne seeds, to accept one-half or one-third

of these hard seeds as of germinating quality, but, even on this basis, samples containing a large percentage of hard seeds have a depreciated value. To remedy this defect, a process has now been found by which hard seeds are rendered quick germinating, and a series of experiments has been carried out with samples of Queensland-grown lucerne.

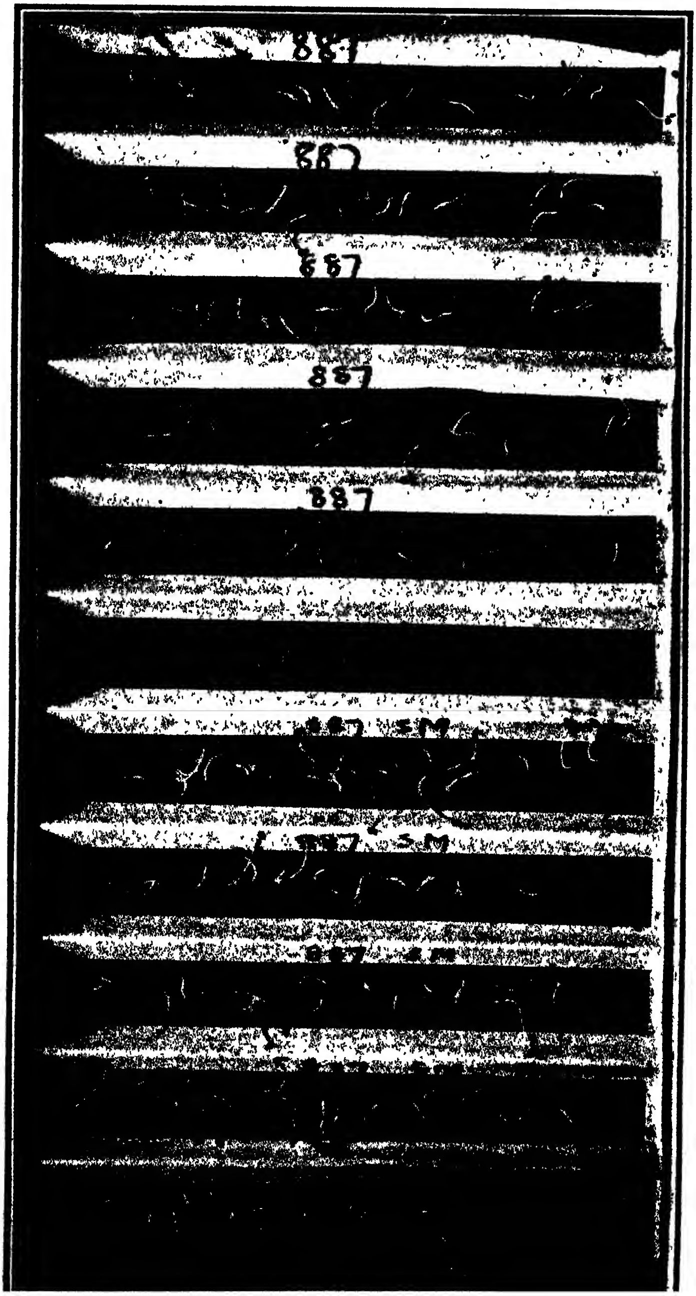


PLATE 1.—TESTING LUCERNE SEED.

The illustration that we give of a seed-testing tray conveys more than a statement of figures only. The top half shows untreated seeds, and the bottom half the same sample after they had been through the process. Both lots were sown on Friday, 19th November, at 10 a.m.; and the photo. was taken on Monday, 22nd November, at 10 a.m., these three days being enough to show the marked difference in energy and growth. After six days the results were as follow:—

Seed direct from grower: Germination, 43 per cent.; hard seeds, 51 per cent.

Same seed treated: Germination, 93 per cent.; hard seeds, nil.

The process of treatment to effect this result, is by driving the seeds through an annular spout over a roughened surface; any ordinary cleaning machine could, with a large driving pulley, be speeded up to the number of revolutions required. Those who are interested would do well to communicate with the Under Secretary for Agriculture for further particulars.

SUDAN GRASS.

We have received many inquiries as to the value of Sudan Grass as a feed for stock. This grass is grown at the Queensland Agricultural College, and there it is considered to be a valuable fodder. We understand that in Southern Illinois (U.S.A.) it is classed as a forage plant and for its kind ranks high, although comparatively little is known about it. Sudan grass grows upright in long slender stems, reaching about 5 ft. in height. It is stated by the "Breeders' Gazette" that wherever oats will grow Sudan grass will eventually take its place. It will grow on any kind of soil, but prefers a clay sandy soil. It is more difficult to care for than timothy on account of its very rank growth. One of its chief values as a feed for horses and cattle lies in the fact that it is very palatable. When fed to either they clean it up thoroughly, showing that they relish it, although it is an entirely new feed to them. This fact alone is always of interest to farmers and feeders. On a ½-acre plot the first cutting made at the rate of 1½ tons to the acre, and in just three weeks the second cutting made practically the same, and there will still be one more crop. Sudan Grass is not well adapted for a wet season, such as Illinois has been having this year. On one place it almost drowned out, but this ground was exceptionally wet, and therefore the conditions encountered were not average. In dry years or in average years Sudan Grass will produce twice as much as any of the common forages, such as oats, barley, millet, and corn (the latter when used as a forage). Taken as a whole Sudan Grass is destined to be one of the greatest hay and forage crops in this country, mainly because it has almost all the good qualities of the best, plus greater production. Sudan Grass is an annual belonging to the sorghum family, but, in appearance and in the quality of the crop produced, it is, for all practical purposes, a grass. Since it is an annual and requires seeding every year, the same as other sorghums and millets, there is no fear of its becoming a pest like Johnson Grass. Sudan Grass has no underground root stocks.

CORN-COBS AS FODDER.

In reply to a question on this subject by a correspondent, Mr. H. C. Quodling, Director of Agriculture, says that the cores by themselves possess little food value, but it has been found in practice that the best results are obtained by grinding the cores and cobs into a fine state of division, for the reason that maizemeal by itself is too concentrated. In the issue of this Journal for November, 1899, we published the following information on the value of corn-cobs as food for stock:—

The subject of ground corn-cobs as a food for stock has given rise to much controversy, especially amongst the farming community in the United States of America, some farmers asserting that once the grain is removed the cobs are of no value, whilst others quite as positively assert that they possess high nutritive value. As there are many tons of cobs annually thrown away or used instead of firewood in this colony, it becomes a matter of very great importance to farmers to know whether they are thus destroying a valuable fodder material, or whether the cobs are, as has been supposed, absolutely useless as feed for stock.

To decide this question, the Department of Agriculture requested Mr. J. C. Brünnich, Chemist to the Department, to furnish an analysis of the corn-cob, and show its value and properties as a fodder.

Mr. Brünnich accordingly supplied the following information, from which it will be seen that, taking the comparative food values, commencing with corn as 100, of certain food materials, lucerne hay comes second and corn-cobs third on the list, corn-stalks fourth, and potatoes fifth:—

REPORT BY MR. J. C. BRÜNNICH, AGRICULTURAL CHEMIST, ON THE VALUE OF CORN-COBS AS A FOOD.

Corn-cobs, as well as corn-stalks, have a considerable value as food, as shown by the following analysis:—

	Albumenoids. Per cent.	Digest. Nutrients. Carbo. hydr. Per cent.	Fat. Per cent.	Comparative Value.
Corn-cobs { from ..	·6	41·7	·2	37
Corn-cobs { to	1·1	43·2	·4	49
Corn-stalks	1·1	37·0	·3	36
Corn	8·4	60·6	4·8	100
Potatoes	2·0	21·8	·2	26
Lucerne hay	9·4	28·3	1·0	65

Professor E. W. Stewart, in his "Feeding Animals," recommends strongly to pass the whole corn crop—stalks, ears, and all—through a large cutter and reducing it to a fine chaff.

Corn-cobs may be ground by themselves to a fine bran-like mass, but the process is slow, and it is questionable if it would pay here.

2

Pastoral.

SHEEP ON THE COAST.

In the second volume of this Journal (May, 1898) we gave a Canadian farmer's

TEN REASONS FOR KEEPING SHEEP.

These were: (1) They are profitable. (2) They weaken the soil least and strengthen it most. (3) They are enemies of weeds. (4) The care they need is required when other farm operations are slack. (5) The amount of investment need not be large. (6) The returns are quick and many. (7) They are the quickest and easiest handled of all farm stock. (8) Other farm products are made more largely from cash grains, while those from the sheep are made principally from the pasture. (9) There is no other product of the farm that has fluctuated so slightly in value as mutton. (10) By comparison wool costs nothing to grow, for do not the horse and the cow in shedding their coats waste what the sheep saves? In conclusion, "let me repeat," he said, "Sheep pay." To this we appended an editoral footnote to the effect that "Sheep will not pay on our coast lands."

This was written in the days when those who attempted sheep-raising on the coast lands—as, for instance, at Caloundra—invariably suffered such losses that the attempt was given up.

To-day the tables have turned; and, mainly owing to the persistent energetic advocacy of the raising of sheep on our coast lands of Mr. W. G. Brown, Instructor in Sheep and Wool, Department of Agriculture and Stock, the coastal rearing of sheep is rapidly extending. Mr. Brown started by stating the reasons for the failures of previous years, amongst which the most prominent were stomach-worms, and the failure to provide artificial pasture, the farmers simply relying on the natural grasses. He has conclusively proved that by using a simple remedy the worm trouble is easily overcome, and that by laying down a few acres of artificial grasses, especially of lucerne and other succulent grasses, certain classes of sheep will thrive on the coast as well as inland, and more sheep (five to eight) can be raised per acre than even on the fertile Downs country and Western plains. Another reason for failure (said Mr. Brown) was the class of sheep brought to the coast in the old days. The farmers held exclusively to the Merino, which, even under the best conditions, will not thrive on the coast, and certainly not where the native herbage is relied on. The breed he advocates, and which has been abundantly proved to be the most suitable as a coast sheep, is the Romney-Marsh; but as pure Romney ewes might, in some cases, be too expensive, a good substitute would be a grade Romney. The Border-Leicester would also do well on the coast.

SOME SUGGESTIONS IN REGARD TO EXPERIMENTING AT STATE FARMS TO SHOW THAT QUEENSLAND SHOULD BE A LARGER PRODUCER OF MEAT AND WOOL.

By W. G. BROWN, Instructor in Sheep and Wool.

As Queensland is a primary producer, anything which can be done to raise the value of her products and increase their volume receives, as it should, the attention of the Department of Agriculture and Stock.

Wool and meat form the bulk of her exports, and are likely to do so for many years, for in consideration of the high prices for these commodities, and which, for reasons set forth below, are likely to keep high, there can be no better paying method of using her lands than in the production of mutton, lamb, and wool.

A very striking change has come over the meat and wool trade during the past ten years. Until about five years ago, the United States of America was a large exporter of beef to the United Kingdom. The Americans sent across to Britain over 3,000,000 cwt. of beef in 1900, and some thousands of live cattle. Since that year the exports have dwindled until about four years ago, when all export had ceased. It is not necessary to look for the cause, but it may be stated that the meat-eating and wool-wearing populaion of the whole world has increased in far greater ratio than has the expansion of production of these commodities. The process, in spite of the war, is still going on. Beef being scarce and becoming relatively scarcer, the world is falling back on mutton and lamb. The present high prices, therefore, for meat and wool are not a passing phase, nor can they be attributed to the war. Unless, therefore, some unheard-of change comes over the population of the world, the present highly remunerative prices are likely to last indefinitely. There are only two countries in the world where there is room for expansion in production of these articles—Argentina and Australia: and, with present methods, expansion is limited in both countries. Beef for export in Victoria, New South Wales, South Australia, and Tasmania is a thing of the past. It takes them all their time to feed themselves, while sheep in those States are practically stationary in numbers.

There is room for expansion in Queensland for both beef, mutton, and wool, and, with a wonderful climate and fertile soil, it seems as if there were facilities for unlimited expansion for the sheep industry here.

In Britain, with an area only one-tenth as great as that of Queensland, there are fed 31,000,000 sheep in small flocks, 1,000 being considered a large one.

It is only in a severe drought that the flocks of Queensland die, or have to be fed on artificial fodder; but in Britain there is a period of five or six months in every year when stock must be fed with stored-up fodder. Our droughts come once in five years on the average, and feed of some kind grows in any month of the year when rain falls. On the coastal areas of Queensland there was an average rainfall of 45 in. per annum over forty-three years, and a glance at the tables shows that

rain falls in greater or less quantity during every month in the year. On the Darlings Downs, Peak Downs, and similar areas beyond the coastal belt, the conditions are drier than in the coastal districts, and drought periods are to be expected. In the Western areas, dry conditions are normal, and droughts more frequent and severe than in Downs country. The soil everywhere is fertile, especially on coastal scrub areas, where the land is exceptionally good. There is no winter in any of these districts, as winter is known in other countries.

In Queensland, therefore, broadly speaking, there exist three sets of conditions to study:—

1st.—*The Coastal Areas,* where a large proportion of the land is exceedingly fertile, and where rain falls regularly, sometimes excessively. On these areas anything whatever can be grown wherewith to feed stock.

2nd.—*The Downs Country,* where the soil is fertile, but which suffers occasionally from a dry spell, In good seasons, much surplus fodder could be—and, if the industry is to thrive, must be—stored against a dry time. Farmers should be shown how—authoritatively.

3rd.—*The Western Country,* whose normal condition is dryness, with one year in five, on the average, of severe drought. The fattening of sheep as a business there, is, and must be for many years, precarious.

There are thus three sets of conditions set up in the feeding of sheep stock in Queensland, and it is necessary that these conditions should be thoroughly studied. Each of these areas may have, and probably has, conditions which would require that certain fodders and certain breeds of sheep should be kept on them. These things should be subject to exact experiment on the part of the State. The machinery lies ready to hand in the shape of State Farms—Warren State Farm, on coastal areas; Hermitage and Gindie State Farms, on Downs areas. The West need not be considered, as those areas are at present best suited to the production of Merinos. For over 100 years these sheep have been studied and types evolved which are the admiration of the world. Queensland is not behind in that respect. It is in the production of sheep primarily bred for mutton that she is behind, less than 3 per cent. of our wool production being of British breeds, or their crosses. With a very large area suitable for growing the mutton breeds, it will be the farmers' own fault if they do not participate in the lucrative business of growing mutton for a world's demand.

There should be exact knowledge as to the fattening of sheep and lambs in this State. We have a big body of evidence to draw upon in the experience of other States, and most of it is valuable. We have, however, problems of our own, since our climatic conditions, being between the tropics, differ markedly from those* of our neighbours.

* These are problems which we have to solve.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF NOVEMBER, 1915.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Margaret	Ayrshire	14 Oct., 1915	989	4·1	47·64	
Madam Melba	Holstein	28 Oct. ,,	1,121	3·4	44·55	
Miss Melba	,, ...	30 Sept. ,,	1,001	3·6	42·25	
Miss Jean ..	Ayrshire	5 Nov. ,,	930	3·5	38·08	
Rosebud ...	,, ...	11 Oct. ,,	853	3·8	37·99	
Sweet Meadows	Jersey	28 Sept. ,,	560	5·5	37·11	
Miss Edition	,, ...	27 Sept. ,,	722	4·1	34·77	
Gretchen ...	Holstein	16 Aug. ,,	915	3·2	34·16	
Twylish's Maid	Jersey	22 Oct. ,,	632	4·5	33·70	
Lucinda ...	Ayrshire	14 Oct. ,,	714	3·5	29·24	
Miss Lark ...	,, ...	8 Sept. ,,	673	3·7	29·17	
Laurette ...	,, ...	9 Oct. ,,	726	3·4	28·85	
Mischief ...	,, ...	27 Sept. ,,	722	3·4	28·69	
Jeannie ...	,, ...	1 Nov. ,,	679	3·6	28·63	
Miss Bell ...	Jersey	2 July ,,	483	5·0	28·49	
Sylvia ..	Shorthorn ...	25 Aug. ,,	636	3·8	28·33	
Lady Twylish	Jersey	5 June ,,	485	4·9	28·02	
Bluebelle ...	,, ...	20 June ,,	549	4·3	27·77	
Jess of Greystanes	Ayrshire	18 Oct. ,,	687	3·3	26·47	
Lennie ...	,, ...	23 July ,,	620	3·6	26·15	
Iron Plate ...	Jersey	21 Feb. ,,	389	5·5	25·29	
Special Edition	,, ...	1 Nov. ,,	522	4·0	24·51	
Noble Dot ..	,, ...	2 May ,,	401	5·0	23·65	
Simple Interest	,, . .	22 Oct. ,,	463	4·2	22·83	
Windyhill Davidina	Ayrshire	21 Aug. ,,	566	3·5	22·76	
Silver Nell ...	Shorthorn ...	16 Aug. ,,	461	4·2	22·74	
Lady May ...	Ayrshire ...	7 Mar. ,,	476	4·0	22·35	
Lady Dorset	,, ...	10 Aug. ,,	540	3·5	22·11	
Lilia ...	,, ...	19 Aug. ,,	592	3·2	22·10	
Netherton Belle	,, ...	23 April ,,	429	4·3	21·70	
Rosine ..	,, ...	7 Aug. ,,	556	3·2	20·75	
Pauline ...	Shorthorn... ...	17 Sept. ,,	551	3·2	20·56	

The dairy herd, in addition to such dry grass as they could pick up in the paddocks, received a ration in the following proportions:—75 lb. oaten chaff, 48 lb. lucerne chaff, 25 lb. bran mixed, and fed at the rate of 20 lb. per cow per day.

WHAT MAKES MILK AND BUTTER YELLOW?

Recent experiments carried on by the United States Department of Agriculture (says "Pure Products") have demonstrated that the rich yellow colour demanded by the public in dairy products is due to the character of the cow's feed.

The experiments were carried on in co-operation with the Missouri State Experiment Station. This question has been studied for many years by dairy experts. Their conclusion is that, although to some extent a breed characteristic, the intensity of the yellow colour may,

within certain limits, be increased or diminished at will by changing the animal's rations.

Chemical tests show that the yellow pigment in milk consists of several well-known pigments found in green plants. Of these the principal one is carotin, so called because it constitutes a large part of the colouring matter of carrots.

The other yellow pigments in the milk are known as xanthophylls. These are found in a number of plants including grass, but are especially abundant in yellow autumn leaves. These pigments pass directly from the feed into the milk. This explains the well-known fact that fresh green grass and carrots increase the yellowness of butter, the only standard by which the average person judges its richness.

On the other hand, a larger proportion of these pigments is deposited in the body fat and elsewhere in the cow. When the ration is changed to one containing fewer colouring constituents, this hoarded store is gradually drawn upon, and in consequence the yellowness of the milk does not decrease so rapidly as it otherwise would. This yellowness increases, however, the instant the necessary plant pigments are restored to the ration. Green grass is probably richer in carotin than any other dairy feed. Cows fed on it will, therefore, produce the highest coloured butter.

Green corn, in which xanthophyll constitutes the chief pigment, will also produce a highly coloured product. On the other hand, a ration of bleached clover hay and yellow corn is practically devoid of yellow pigments, and the resultant milk from the cows fed upon it will gradually lose its colour. It is, of course, indisputably true that the breed does influence the colour of the milk fat, but vary the ration and there will be a corresponding variation in the colour of the milk fat in each breed.

EYE BLIGHT IN CATTLE.

With reference to a disease of the eyes in the dairy herd of a farmer at Wondai, who had tried rubbing in honey as a remedy, Mr. A. McGown, Veterinary Surgeon of the Department of Agriculture, advised that the animals were suffering from blight which is carried from cow to cow by flies. It is a mistake, he said, to put honey around the eyes, as this attracts the flies. The eyes should be painted daily with the following lotion:—Nitrate of Silver, 5 grs.; Distilled Water, 1 oz. This is best applied by means of a camel-hair brush or a feather.

The skin round the eyes should be smeared with the following dressing:—Spirits of Tar, 1 oz.; Olive Oil, 6 oz.

ISLINGTON DAIRY SHOW.

At the Islington (England) Dairy Show, held on 19th October, 1915, there were, in the colonial classes, 16 exhibits of butter from Queensland, 8 from New South Wales, 5 from Victoria, 1 from South Australia, 1 from New Zealand, and 2 from South Africa, making a total of only 33 factories exhibiting as against 69 last year and 70 in 1913. The following are the details of the Queensland exhibits, showing the points

gained in the salted and unsalted classes. It will be noticed that in the total points of both classes Boonah is first with 182 points, Biggenden second with 181 points, Warwick and Booval third with 179 points each:—

SALTED.

Factory.	Flavour.	Texture.	Colour.	Salting.	Packing.	Total.
Boonah	51	19	9	10	4	93
Oakey	52	18	9	9	4	92
Kingaroy	49	18	10	10	5	92
Murgon	52	18	9	8	5	92
Biggenden	50	18	9	9	5	91
Clifton	50	18	10	9	4	91
Goombungee	50	18	9	9	4	90
Booval	50	17	9	10	4	90
Warwick	50	18	9	9	3	89
Allora	48	18	9	9	4	88
Grantham	48	19	9	8	4	88
Laidley	48	15	10	10	4	87
Mount Bismarck	48	18	8	9	3	86
Kin Kin	48	16	8	9	4	85
Downs Co-operative ..	45	17	8	9	5	84

UNSALTED.

Factory.	Flavour.	Texture.	Colour.	Packing.	Total.
Stanley River	56	22	9	4	91
Warwick	55	23	8	4	90
Biggenden	54	23	9	4	90
Downs Co-operative	56	21	9	4	90
Booval	54	22	9	4	89
Boonah	54	22	9	4	89
Goombungee	55	22	8	3	88
Laidley	54	21	9	4	88
Mount Bismarck	55	20	8	3	86
Grantham	53	22	8	3	86
Kingaroy	52	20	9	5	86
Allora	50	22	8	4	84
Oakey	52	21	7	3	83
Clifton	50	20	9	4	83
Caboolture	52	18	7	4	81
Kin Kin	50	18	8	3	79

MAKING CHEESE IN HOT WEATHER.

Referring to the question of keeping the Sunday's milk for delivery to the cheese factory on the following Monday, the Chief Instructor in Dairying states that, unless the temperature of the milk is reduced by artificial irrigation to extremely low temperatures, the fluid cannot possibly be kept in a fit condition for cheese-making purposes during the warmer months of the year. In practice it is found that to keep milk even for a period of fifteen hours during the summer months necessitates a good deal of attention being given to the cooling of milk, and it is only in the depth of winter that the milk-suppliers to the Downs Cheese Factories are able to hold the milk over the Sunday.

FEEDING CALVES ON LINSEED MEAL.

Linseed-meal may be fed to calves with the greatest advantage by pursuing the following methods:—

Take a quantity of linseed-meal and reduce it to a thick paste by the addition of skim milk. Add one cupful of the paste to the skim milk or other fluid fed to the young calf at each meal. As the calf ages, the quantity of linseed, after preparation as above stated, may be gradually increased to 1 or 2 lb. each day, the amounts being dependent on the nature and quantity of the other foods available in conjunction with the linseed-meal. If the supply of skimmed milk is limited, and water constitutes the principal fluid utilised, it then becomes necessary to increase the quantity of linseed-meal in the ration. The calf, until some days old, will thrive best if fed on the milk of its mother, but as soon as it attains the age at which it nibbles grass linseed-meal may be used with confidence.

FLY EXCLUDER FROM MILK OR CREAM CANS.

Mr. H. B. Hooper, Dairy Supervisor to the Kerang Municipal Council, forwards the details of a fly excluder from milk or cream cans.

The article is described " as being about 7 in. high, and of a width equal to the inner surface of a cream can—different sizes for larger or

FLY EXCLUDER FOR MILK CANS.

smaller cans. A little above the bottom is a flange to rest on the top of the can. The body portion is cut out of one piece of flat metal, bent to a circle, and the ends joined with open spaces cut out. These are closed by a strip of gauze wire fastened around the inner side, and giving 3 in.

vertical airway. The top is open, and when in use is closed by the lid of the can placed on top."

It would seem that the two main defects in fly excluders seen in the dairies are:—Insufficient play of air above the cream, and the danger of fly-blows or other particles dropping through the horizontally-placed gauze. It is claimed that, by means of the gauze being vertical, the freedom for the movement of air across the top of the can and the protective flange has been attained, and these defects have been overcome.—"Journal of Agriculture of Victoria."

THE GOAT AS A SOURCE OF MILK.

In the July and September (1915) issues of this Journal we published some interesting information on the value of the milch goat, and on its feeding and management. From the October issue of the "Journal of the Board of Agriculture," London, we take the following article on "The Goat as a Source of Milk," with the accompanying illustrations of different breeds:—

All the objections which apply to the keeping of a cow by a cottager are met in the case of a goat. The first expenditure for its purchase is within his means, housing accommodation is reduced to a minimum, the food in summer costs very little, and there is no great expense to be borne for the maintenance of the animal in periods when it is unprofitable.

It is for domestic rather than business purposes that the goat is here recommended. Some writers have maintained that there is a fortune to be made out of goat-farming, but under present conditions this is not the case. It would not be wise for anyone, especially if possessed of only a small capital, to embark in any such undertaking in the hope of making a living out of it. The reason is simple. There is no demand on anything like a commercial scale for goats' milk, and, though the demand for goats is large and ever-increasing, it is very doubtful if the breeding and rearing of stock for sale would be a profitable venture.

It may be quite possible for individual goat-breeders, who have been fortunate in securing the custom of a hospital or private patients in the locality, to make the industry profitable, as the milk may then often be sold at 1s. a quart, but such opportunities are very rare. Any attempt to sell goats' milk on a commercial scale is, moreover, seriously handicapped by the difficulty of maintaining a continuous supply of milk during the autumn and winter months.*

Goats' Milk.—Unfortunately, there has been for many years a widespread belief that goats' milk always possesses a peculiar flavour. It will generally be found on inquiry that people who hold this opinion have based it on their experience as tourists in Switzerland. This flavour may possibly be caused by the consumption of certain herbs, but it is far more probable that it arises from a want of cleanliness in the utensils

* The references to feeding and milk supply in autumn and winter do not apply to Queensland, where food is plentiful all the year round.—Ed "Q.A.J."

employed. It is quite certain that the milk from the same Swiss breed in England is not so affected, whilst it is also true that all goats' milk will develop a "goaty" flavour if strict attention is not paid to hygienic conditions.

There are two special qualities possessed by goats' milk which alone should make it popular:—

1. The ease with which it is digested by children, and especially infants.
2. Its almost complete immunity from germs of tuberculosis.

With regard to the first point, the substitution of goats' for cows' milk has been instrumental in saving many young lives. The explanation of this superior digestibility is furnished on scientific grounds by at least two authorities. The late Dr. Augustus Voelcker held that it was due to the fact that the cream globules were much smaller than in cows' milk, and in a more perfect state of emulsion. The explanation of Dr. Barbellion, a French medical authority, is that the curd of cows' milk forms a dense adhering mass which by agitation separates into clots that are but slightly soluble, but the curd of goats' milk forms very small light flakes, which are soft, very pliable, and very soluble, like those in the milk of the ass and in human milk. Samples of these latter as well as goats' milk were submitted to the action of digestive ferments and were found to be digested completely in twenty hours, whilst the same process applied to cows' milk showed only a very slight progress after sixty hours.

So much has been written on the prevalence of tuberculosis amongst cows and the possibility of communicating the disease to the human subject through the milk that, when it is fully recognised how comparatively free from such germs goats' milk has been proved to be, this valuable quality should stimulate its use. In this connection Sir William Broadbent may be quoted. In his address to students on the "Prevention of Consumption and other forms of Tuberculosis," he said: "It is interesting to note that asses and goats do not suffer from tuberculosis, and to bear in mind that the shrewd physicians of past days used to order asses' and goats' milk for persons threatened with consumption."

Goats' Milk for Domestic Use.—To realise the difference between goats' and cows' milk one has only to return to the latter after a course of goats' milk. The difference is very much the same as when skimmed milk is substituted for whole milk. This superiority is not so noticeable when goats' milk is drunk by itself as when it is taken in tea or coffee, or used in milk puddings, custards, and blanc-manges; the rich, creamy taste is then very marked. The taste may possibly be accounted for by

some of the reasons given in regard to digestibility. It cannot be entirely ascribed to a higher fat content, because, although in a general way goats' milk contains 2 per cent.—and sometimes 4 per cent.—more butter-fat in its composition than cows' milk, the same distinctive quality of goats' milk is to some extent observable even in cases where the fat content is less than that of cows' milk.

The Yield of Milk.—An average goat will give at its flush 3 pints a day. A good many give more and a few give less; but a goat yielding less than 1 quart at that stage is hardly worth keeping. This flush of milk should last for at least three months, though the later in the season the goat kids, the greater is the tendency for this period to diminish. Thus, a goat that kids in July will seldom maintain her first yield as long as one that kids in March, whilst, should kidding take place during the rutting season—that is, in October, November, and December—the maximum period will be still shorter. The goat which has been giving 3 pints daily from March to June may be expected to give on the average a quart for the next three months, and if during the subsequent three she gives about 1 pint a day, the yield may be considered satisfactory. The total milk yield will have amounted to about 67 galls., or 670 lb., which, at the cheap price of 5d. a quart, represents a value of £5 11s. 8d. Better milkers will give 2 quarts for the first three months, and their total yield may be set down at from 80 to 90 galls., whilst the best goats may sometimes yield 3 quarts. In exceptional cases even larger yields have been recorded. "Sedgmere Faith," an imported Swiss, milked daily for five days, gave an average yield per day of 10 lb. 5 oz., or over a gallon; this was, moreover, in the month of August after having been in milk for five months. The champion milker, "Leazes Eve" (Fig. 5), yielded during

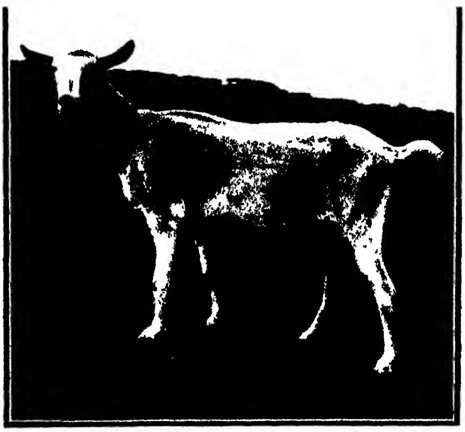


FIG. 5.—"Leazes Eve," Anglo-Nubian Saanen, a Champion Milking Goat.

the three weeks ending 18th May, 1912 (having been in profit since 27th April), no less than 242 lb. 13 oz., or over 97 quarts. This goat, indeed, gave nearly half a ton of milk during the first fifteen weeks after kidding. Champion " Wigmore Topsy " is another extraordinary milker that has given over 1 gall. a day. The illustration (Fig. 6) shows her excellent

FIG. 6.—"Wigmore Topsy," a Gallon Milker.

udder and well-shaped teats. It should be pointed out, however, that these yields are rare.

Cost of Food compared with Value of Milk.—In estimating the cost of keeping goats to provide milk for home consumption, it is understood that they are fed by a member of the family and that no land is rented especially for them. Rent and wages may, therefore, be neglected. Opinions vary as to the cost of feeding, but it may be said that with a paddock or good-sized kitchen garden available, the cost of keep during the six months of spring and summer should not exceed 1s. a week per goat, or say £1 5s. During the remainder of the year, under the " soiling " system, to be explained presently, the goat will consume on an average each day 2 lb. of hay, costing 1d., about ¼ lb. of oats and 2 oz. of bran, which may be set down as amounting to another 1d., or a total of about £1 10s. During the short period that garden produce is not available roots will have to be purchased, and the cost of these would bring the total for the other six months to, say, £2. This, added to the £1 5s. previously mentioned, makes £3 5s. per annum. Even with an average goat it will be seen that a very fair profit is made. With a superior milker the profit would be considerably greater. The cost of litter—peat moss or straw—and other incidental charges such as service of goat, &c., have not been included, as the value of the manure, no insignificant item, may be set against the former, and the value of kids against the latter. The above is only a rough estimate, and the cost is not based on the prices quoted on the market to-day, but on those prevailing in normal times. On the other hand the costs suggested would be greatly reduced if the extra foods were purchased in fairly considerable quantities.

Habits of the Goat.—The goat is naturally of a roving disposition. It passes rapidly from one form of food to another and rarely stops more than a short time at each, however sweet and attractive it may be. When a goat's fancy can be thus indulged it thrives amazingly, but, unfortunately, its innate delight in mischief—apparently for mischief's sake—renders it necessary to keep it under control. Ordinary fencing is generally useless, for a goat will jump hurdles readily and make its way through the thickest hedge if the least weak spot is to be found. Unless the lines are set very close even barbed wire will not prove an effective bar, should there happen to be any very tempting bait on the other side. Where pasturage is provided, therefore, tethering is necessary. To make this system of feeding successful, frequent change of ground should be possible. Some people endeavour to keep a goat within the narrow limits of a tennis court or a lawn throughout the summer. It is possible that were such a plot reserved entirely for the goat and scarcely ever trodden on by human feet it might provide nourishment for the animal for a certain period, but after a time the soil becomes tainted and the grass practically poisonous to the goat. This result is evidenced by the loss of flesh, anæmic condition, and the other well-known symptoms of a fatal disorder which, for want of a better name, has been called "a disease peculiar to goats." As a matter of fact, pasturage is by no means necessary to goats, and, unless they have the range of a big meadow or a park, they will live longer and thrive better, generally speaking, without it.

Tethering.—There are two methods of tethering: (1) by a chain, about 3 or 4 yards long, attached to an iron pin driven into the ground, and (2) by using a length of thick galvanised wire, or, better still, as being stronger, one composed of several strands of thin wire twisted together. This wire, which may be 20 yards or more in length, should be stretched firmly along the surface of the grass and securely pegged down at each end. The goat may then be attached to the wire by means of a short chain, one end of which is fastened to the goat's collar and the other hooked on to the wire by means of a spring hook. The hook moves backwards and forwards with the progress of the goat, which has thus the whole 20 yards as a length of run. This method of tethering allows the goat greater freedom than is the case when a single tethering pin is used. In both cases, however, it is most essential that the pin be driven close down to the level of the ground, otherwise the chain is liable to get caught on, and wound round, the projecting head, thus restricting the amount of liberty allowed the animal. A cord should never be used for tethering, for when it becomes wet it twists and brings about the same result. The length of the pin will depend on the kind of soil—say, 2 ft. on light soil and 18 in. on heavy land.

It is necessary to warn the goat-keeper not to attempt tethering from the middle of October to the beginning of April.* Grass in winter has but little nutritive value, whilst exposure to cold winds and the elements generally without the necessary shelter, or exercise to promote

* Not applicable to the Queensland winter season.—Ed. "Q.A.J."

circulation, often causes lung trouble and diarrhœa. It is desirable, also, that the change to grass in the spring should be gradual, or the fresh herbage is certain to cause bad attacks of scour, which, if neglected, may have a fatal termination.

Housing and the "Soiling" System.—During the autumn and winter months goats are best kept on the "Soiling System"—that is, the animals are housed and all their food is brought to them. Where a considerable number are kept it is advisable to erect a special goat-house, or to adapt some existing building for the purpose. A simple form of house is a loose box or outhouse, bedded down with peat-moss litter. Feeding receptacles, preferably small galvanised pails, may be arranged on one side, a hay-rack on another side, and a long bench about 2 ft. wide and the same height from the ground on a third side. This bench serves as a sleeping as well as a milking bench. Goats prefer a hard bed, and especially one that is raised above the level of the floor. The objections to the loose box are that when the inmates are strangers to one another they are apt to fight, and when one acts the bully she prevents her companions from getting their share of food. In the former case the goats will probably fraternise as they get accustomed to one another, but in the latter the troublesome animal should either be removed or fastened to a ring in the wall. An alternative plan to the loose box is to erect miniature stalls. Space does not admit of details for the construction of such stalls, but these may readily be obtained by consulting one of the books on goat-keeping. Stalls occupy less space, but give more trouble, as they require cleaning out daily to keep them sweet; further, unless the stall is quite narrow—2½ ft. in width at the most—and the stall-chain quite short and fastened to the centre in front and not at either side, the goat is likely to turn round, in which case the droppings fall into the feeding pail and get mixed with the food.

Points in Feeding Goats.—The goat-keeper must bear in mind three important points in feeding his stock. The first and most important consideration is absolute cleanliness, both in the food itself and in the receptacle for it. The best form of receptacle is a metal pail; wooden mangers are objectionable, as they get gnawed away and are more difficult to keep sweet. The second point is that variety of food is essential; no animal tires so quickly of the same food as the goat, and it will soon give up eating if a change is not provided. The third point is one of economy. If a goat is fed carelessly, without due regard to its tastes or capacity, it may cost as much as its return in milk is worth; thus hay may be wasted to any amount if thrown on the ground or if placed in the hay-rack in needlessly large quantities. In order that this fodder may not be too readily pulled out and only tit-bits consumed, it is necessary that

the bars of the hay-rack should be not more than 1½ in. apart. A still more economical plan when hay is scarce and dear is to give it only in the form of chaff mixed with oats and bran. Oats again will be wasted if mixed with the residue of the previous meal. Bran is best given by itself, either dry or better still as a mash. It may be added to chopped roots or potatoes, but never to corn, since to obtain the corn more readily goats will often blow away the bran. Middlings or sharps may be given instead of bran for a change with chopped vegetables.

From their kid stage goats should be encouraged to eat all vegetable waste from the kitchen, or household scraps, such as broken bread, bits of toast, boiled potatoes, oatmeal porridge, &c. In the garden there is scarcely any plant which is not acceptable. The greatest care should be taken, however, to prevent goats from eating such more or less poisonous shrubs as rhododendrons, yew, privet, and laurels. When the supply of garden produce fails, swedes or mangolds should be purchased if they can be obtained at reasonable prices. To save trouble to the attendant, and also to keep the goat occupied, these roots are best given whole, after careful washing, but they may be chopped into " fingers " as for sheep. In the former case the goat will scoop out the flesh, leaving the outside skin as a shell.

In summer, grass may be cut and supplied instead of hay; this is the most economical way of utilising it. People who live in the heart of the country can take a goat along the lanes for a walk like a dog, allowing it to nibble at the roadside as it goes along.

How to start Goat-keeping.—One of the greatest difficulties which beset the prospective goat-keeper is to obtain suitable stock. The best specimens of goats are frequently sent to the colonies and the United States of America, and as no fresh stock can be imported from abroad to replace them, it is necessary to depend entirely on home-bred animals. There is still available a fair number of common goats, but many beginners are too ambitious and wish to start straight away with expensive pedigree goats. It is much better to begin with the common goat costing up to £2 or £3, and to improve the stock later. This may be accomplished in the following manner:—Well-bred kids of good pedigree may often be obtained comparatively cheaply by previous arrangement with the owners of well-known strains. The purchaser should endeavour to procure only " Herd Book " stock with, if possible, " milking blood " on the side of both the sire and dam, but at least on one side. When the common goat has a kid or kids, these should be destroyed at birth and the unweaned kid of superior pedigree should be fostered upon it; this may be easily done if the kid is under a fortnight old. The cost of the

pedigree kid may be 15s. or even a guinea, but the money will be well spent, as the stud fee would probably have amounted to as much.

"Herd Book" stock should not be confused with animals that are merely entered in the "Kid Register." Novices in goat-keeping are unfortunately often deceived by the statement that a goat is "registered." This word is frequently used to give the impression that the animal is entered in the "Herd Book," but though most of the entries in this volume appear also in the "Kid Register" only a few of those in the latter will be found in the "Herd Book." The "Kid Register," it should be explained, is in no sense a record of pedigree, but merely a guarantee of age, and is intended chiefly as a qualification in that respect for competition in kid or goatling classes. Every goat that is entered in the "Herd Book" is given a number, and that number is supplied on the certificate card issued by the "Herd Book" editor, of the British Goat Society.

In selecting a goat it is well to remember that there are certain features which may be regarded as characteristics of milk production. The body should be long and fairly deep, although if the latter point is very marked it is probable that the animal is aged. The ribs must be well sprung—this is important—whilst a long head and a slender neck are generally considered to indicate a good milker. If the goat is dry the quality of the udder cannot be ascertained, but if in profit the udder should be carefully examined. It should not only be of good size but soft and pliable, and the teats should be long and pointed, as they are then most easily handled. It is always desirable for the purchaser to see the goat he is about to buy milked at least once before parting with his money. This is necessary not merely to ascertain the actual yield but to find out if the animal stands quietly to be milked, as a good milking goat is often parted with on account of the trouble she gives the owner in drawing the milk from her. A goat purchased in profit should not be less than two years old or over five. The age can be detected by examining the teeth, for particulars of which the reader should refer to the various books on the subject.

The Breeds of Goats.—In this country there are at most five breeds of goats, two of which belong to what may be called the common kind, and the other three to the improved varieties. The first are the English and the Irish goats, the former being short-haired, with horns rather small and branching outwards, and the latter long-haired with more upright horns. Both are prick-eared and, with slight differences, resemble the common goat in other parts of Europe. The superior breeds in their order of value as milkers are the Toggenburg of Swiss origin, the only strictly pure breed we possess, and the Anglo-Nubian, a variety now regarded as a separate breed but produced many years ago by crossing the English goat with imported stock from the East. A separate section in the "Herd Book" is devoted to this variety and another to the Toggenburg.

As regards the Toggenburg, a description is advisable to enable anyone not an expert to recognise a true specimen. This is the more

necessary, as, in consequence of its comparative rarity in this country and the high prices it commands, goats of inferior breeds are frequently sold to the uninitiated. The chief peculiarity consists in the colour, which is invariably a light drab, though when the hair is long it approaches somewhat to sandy. This colour is relieved by white markings which are shown on the head by a white streak down each side of the face, a white muzzle, and ears having more or less the same absence of colour. White is also present under the tail, on each side of the rump, on the limbs from the knee and hocks downwards, and very frequently under the belly. The accompanying illustrations (Fig. 1 and Fig. 2)

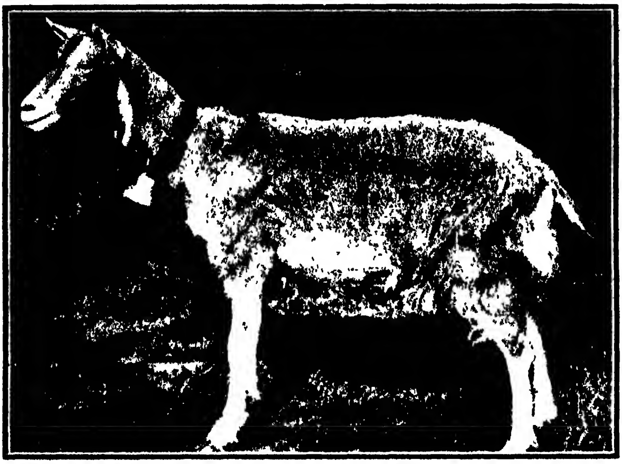


FIG. 1.—A Toggenburg from the Toggenburg Valley, Canton St. Gall, Switzerland.

show most of these markings and also two tassel-like appendages which are almost invariably present, though not restricted to this breed. Horns are often seen on the Toggenburgs in England, though in Switzerland

FIG. 2.—Group of Toggenburg Kids.

they are rarely met with, the breed being there regarded as hornless. The Saanen, also known as the Appenzell, another Swiss breed, is like

the Toggenburg in form, but is entirely white. Fig. 3 gives a good illustration of this variety.

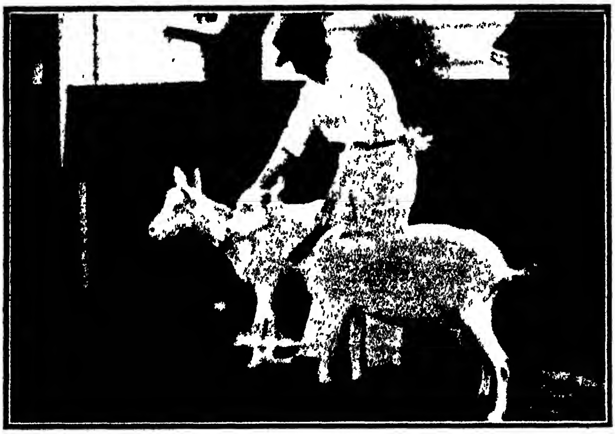


FIG. 3.—Saanen Goat, Imported into the United States from Switzerland.

In addition to these breeds, there are what are known as "Swiss" and "Anglo-Swiss," the former being a cross between the Toggenburg and other Swiss breeds, and the latter a cross again of these with the common goat or the Anglo-Nubian. Probably this last cross represents the best all-round goat we possess, as it combines the heavy yield of the Swiss, be it Toggenburg or Saanen, with the superior quality, as regards butter-fat, of the Anglo-Nubian. A good specimen of this cross is shown in Fig. 4, whilst Fig. 5 illustrates a similar combination, but with the

FIG. 4.—An Anglo-Nubian Toggenburg, showing Development of Udder.

Saanen in place of the Toggenburg, the Swiss here predominating over the Eastern blood. To the average goat-keeper who wants a milker and

cannot afford a high price the matter of breed need not be greatly considered. Nearly all the best milkers of the present day are cross-bred animals, the result of careful selection from known milking strains. A careful study of the "Herd Book," which is issued in parts, will reveal the strains in which the milking feature predominates, as each part contains what is called the "Star Section" restricted to winners of milking prizes. Goats in this section have one or more asterisks affixed to their names to indicate this attribute. The student of goat-breeding is therefore recommended, in making his selection, to trust more to the strain than to the breed in starting a herd of milkers.

Breeding.—The pairing season for goats is from September to January, but the sooner the service can be arranged the better, as it is desirable that the female should have her kids in February or March, so that the young ones may have all the spring and summer before them. The period of gestation is about twenty-one weeks, or, roughly, five months. She-goats that have not been served previously will come into season during January and even, though less frequently, in February, but after that month oestrum will occur only very exceptionally until the following September. People who keep three goats—and this number is necessary to provide an average family with milk during the greater part of the year—should endeavour to arrange for the service of one in September or early in October, the second in November or December, and the third, if possible, in February.

Signs of oestrum in the female are in some cases very transient, especially in the late spring and summer. These signs consist in frequent bleating, a constant shaking of the tail, a turgid condition of the vulva, loss of appetite, and restlessness, and if the goat is in milk a temporary diminution in the milk yield. This condition will last from one to three days.

It is essential, if the owner is endeavouring to improve his stock for milk production, to secure the services of a male bred from a good milker, or, still better, having "milking blood" on both sides of his parentage. The kids will then be worth rearing; otherwise it is far better to kill them at birth and to use all the milk from the goat for domestic purposes. It seldom pays to rear male kids, and it is usually less expensive to pay even a guinea fee for the services of a good male than to rear and keep a stud goat, as the odour and objectionable habits of these animals render them anything but desirable pets.

A she-goat that has given birth to kids generally recovers without much difficulty. If it is decided to rear the young ones they may be left with the dam for six or eight weeks and then weaned, but if the value of the milk consumed during this period is reckoned, the kids will be found in most cases to have cost more than they are worth.

Milking and Care of Milk.—For the first three or four days after kidding the milk is specially adapted to the young kids and is not suitable for human consumption. After that time, however, the goat can be milked at least twice daily, or three times if the yield amounts to something like a quart on each occasion.

Milking consists in sliding the first finger and thumb along the teat and squeezing out the milk. It is an operation easily learnt, but requires some practice before the requisite facility can be acquired. In regard to milking two points should be emphasised. Milking should be carried out at regular intervals and the udder completely emptied each time. The more quickly the milking is performed the better, for if lingered over the goat gets fidgety and impatient and is very apt to place a hoof in the pail or pan, or to upset the receptacle. An impatient animal should therefore be carefully watched towards the end of the operation, and any such movement prevented as far as possible. It is a good plan in such cases for the operator to have an empty jug placed beside him, in which to pour the milk as the process goes on. The last drops, or "strippings," are always the richest.

All utensils must be kept scrupulously clean by scalding with boiling water and exposure for a time to the air, so as to avoid all odour of stale milk. As milk is easily contaminated, it should not be brought into contact with any strong-smelling substance. When the milk is brought from the goat-house, it should be drained through a clean butter-cloth, placed over a perforated basin, into the pan intended for its reception. It should then be stored in a cool place—a dairy for preference—till required for use.

THE BOT FLY.

When the larvæ of the bot fly are deposited on a horse's skin, they begin to crawl about, and thus set up an irritation which causes the horse to lick the part, and in this way they gain entrance to the stomach, where they attach themselves and remain in this state for ten months before being expelled. The fly generally lays its eggs on the flanks of a horse, and almost always on spots which the animal can reach with its tongue. Various suggestions have been made as to the best means to destroy the eggs. One grazier says that the simplest way is to strike matches and lightly burn the hair from the egg-infested patches without hurting the horse. Regular grooming would probably remove the eggs, but thousands of horses never get any grooming, and all that can be done with these is to try the match business, or wash the parts with dilute carbolic acid or kerosene, or dose with Tansy tea followed, a few hours later, by ½ oz. of salts. It was (said the grazier) shown by a German professor that a dose of Tansy tea, followed by the salts, is a certain cure, hundreds of worms being expelled by this means.

Mr. McGown, Veterinary Surgeon of the Department of Agriculture and Stock, says that there may be no signs of the animal being affected, and it will only be noticed on the expulsion of the larvæ. Unless they are in great numbers, little or no inconvenience is caused to the animal. To protect a horse from an attack of the fly, the chin and knees should be smeared daily with the following dressing:—

Oil of Tar, 1 oz.; Olive Oil, 6 oz.

If the parasite is noticed to be present, the animal should receive 2 oz. of oil of turpentine and 1 pint of raw linseed oil, followed in a few days by a dose of Barbados Aloes.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1915.

Six thousand six hundred and fifty-four eggs were laid during the month, an average of over 125 eggs per pen. As predicted last month, there has been a falling-off owing to our being unable to supply green feed. Scalded lucerne chaff was substituted, but this cannot take the place of green feed. The weather has been very oppressive during the first part of the month, the thermometer registering as high as 108 degrees on the 12th. The hot winds prevailing caused great distress to the birds, and they were only saved by a copious supply of water in the houses. Broodies were very numerous during the month, the Leghorns trying to excel the heavy breeds in this respect. J. D. Nicholson, N.S.W., wins the monthly prize with 142 eggs. The following are the individual records:—

Competitors.	Breed.	Nov.	Total.
C. E. Bertelsmeier, S.A.	White Leghorns	135	1,035
Jas. McKay	Do.	119	1,027
Mrs. Munro	Do.	135	1,019
J. D. Nicholson, N.S.W.	Do.	142	1,010
J. Gosley	Do.	120	1,006
A. H. Padman, S.A.	Do.	141	996
A. W. Bailey	Do.	129	992
J. M. Manson	Black Orpingtons	131	992
E. F. Dennis	White Leghorns	135	988
J. R. Wilson	Do.	135	988
Mrs. J. Jobling, N.S.W.	Black Orpingtons	102	980
Kelvin Poultry Farm	White Leghorns	118	978
King and Watson, N.S.W.	Do.	128	966
S. E. Sharpe	Do.	112	965
J. M. Manson	Do.	138	960
O.K. Poultry Farm	Do.	138	952
A. T. Coomber	Do.	130	944
E. A. Smith	Do.	138	939
T. Fanning	Black Orpingtons	132	940
C. T. Clark	White Leghorns	126	935
C. Knoblauch	Do.	133	927
H. Hammill, N.S.W.	Do.	124	924
W. Parker	Do.	134	923
E. V. Bennett, S.A.	Do.	126	921
T. Fanning	Do.	135	918
W. Purvis, S.A.	Do.	128	916
E. Le Breton	Do.	115	913
R. Burns	Black Orpingtons	120	906
F. Clayton, N.S.W.	White Leghorns	127	904
Cowan Bros., N.S.W.	Do.	125	898
Moritz Bros., S.A.	Do.	130	887
R. Jobling, N.S.W.	Do.	109	881
Derrylin Poultry Farm	Do.	129	881
E. A. Smith	Black Orpingtons	138	880

Competitors.	Breed.	Nov.	Total.
W. Lindus, N.S.W.	White Leghorns ...	125	877
W. Meneely	Black Orpingtons ...	111	877
Geo. Tomlinson	White Leghorns ...	119	876
R. Burns	S. L. Wyandottes ...	117	874
Cowan Bros., N.S.W.	Black Orpingtons ...	104	859
Wm. Lyell	White Leghorns ...	115	854
J. Zahl	Do. (No. 1)	122	845
J. G. Richter	Do.	135	844
J. H. Gill, Victoria	Do.	133	842
R. Jobling, N.S.W.	S. L. Wyandottes ...	98	834
J. Aitchison	White Leghorns ...	124	830
G. H. Turner	Do.	118	829
Loloma Poultry Farm, N.S.W. ...	Rhode Island Reds ...	129	814
J. Zahl	White Leghorns (No. 2)	115	798
E. Pocock	Do.	118	786
S. Chapman	Brown Leghorns ...	137	727
F. Clayton, N.S.W.	Rhode Island Reds ...	123	727
W. H. Forsyth, N.S.W.	White Leghorns ...	133	712
J. R. Johnstone	Plymouth Rocks ...	121	559
Totals	...	6,654	47,655

ANALYSES OF QUEENSLAND-GROWN COPRA.

1. Sample from the State Nursery, Kamerunga, Cairns:—Nett weight received, 10·5 oz.; moisture, 5·2 per cent.; oil, 62·8 per cent.

2. Small Nut ("King"): Per cent. of air-dry material in green kernel, 48·0; per cent. of oil in air-dry kernel, 60·4. Large Nut: Percentage of air-dry material in green kernel, 75·0; per cent. of oil in air-dry kernel, 39·5. The kernel of the smaller nut (rather unripe) of "King" variety contained 60·4 per cent. of oil in the air-dry substance, which is a fairly high amount; whereas the common variety only contained 39·5 per cent.

3. Four nuts sent, but only three received, all analysed separately. 1st Nut: Per cent. of air-dry material in green kernel, 44·6; per cent. of oil in dry kernel, 41·0. 2nd Nut: Per cent. of air-dry material in green kernel, 46·6; per cent. of oil, 60·0. 3rd Nut (very green): Per cent. of air-dry material in green kernel, 20·0; per cent. of oil, 45·0.

4. Sample from Double Island, near Cairns: Commercial copra—Moisture, 4·7 per cent.; oil, 57·8 per cent.; consequently very fair quality. Percentage of oil in copra: The average yield of oil from sun-dried copra in the Philippines is 60·3 per cent.; Cuba, 63 per cent.; West Indies generally, 61·8 per cent.; Mauritius, 52 per cent.

State Farms.

STATE FARM, BUNGEWORGORAI.

The manager reports for the month ending 13th November, 1915:—

Meteorological.—These conditions still remain dry, which, in conjunction with the high temperatures and strong hot winds, is having a baneful effect upon vegetation of all descriptions. The maximum temperature recorded was 106·7 degrees Fahr.; rainfall, ·16.

Crops.—The harvesting of the winter cereals has been completed, the returns in most instances being less than even the poor appearance of the crops gave promise of. Notwithstanding this, grain of fair quality in some instances was obtained. From a financial point of view, the crop, as a whole, was a failure; but from an experimental point of view such is not the case, as sufficient grain, &c., was obtained to afford information as to the relative value of the different varieties grown, in certain directions, under conditions such as have been experienced.

Summer Crops.—Those mentioned as having germinated at the time of forwarding my last report are still alive and in a condition to respond to genial showers. The vitality displayed by the Teff Grass, at a stage in its growth when other crops are extremely susceptible to dry conditions, is remarkable. As, although only 1 in. in height and the soil having been absolutely devoid of moisture for the last six weeks, it is still alive.

Vineyard.—The early grapes, on the whole, are of very poor promise, owing wholly to the absence of rain during the last few weeks. The late varieties are still in that stage when a fall of rain would prove beneficial.

Orchard.—Citrus: The citrus fruit trees throughout are in a most unfavourable condition. Deciduous: The trellised peaches are the only deciduous fruits giving promise of any crop at all.

Cattle.—With the exception of cows with calves, these are holding their condition fairly well.

Horses.—Most of the horses, young and old, are suffering from strangles, which, owing to the absence of green feed, causes them to lose condition rapidly.

Manager's report for month ending December, 1915:—

The rainfall during the period under review was 55 points, being sufficient to germinate seeds sown on light soils, but of very little benefit to permanent vegetation such as fruit trees, &c.

The maximum temperature recorded was 107·5 degrees Fahr.

Grapes, which gave promise of a heavy yield, have not developed the berries, consequently the yield will be light and of poor quality.

Some of the apricot trees, which have until recently shown no ill effects from the dry weather, are dying.

Cattle and horses are looking fairly well. The former are being fed on scorched pear in addition to the pick they get in the paddock. If it had not been for the prickly-pear very few cattle would now be alive in this locality. Whilst speaking about pear, I may state that one farmer told me that he had fed his horses and cattle on boiled pear and pollard since last August, and at the present time the former are in first-class working order. Pollard seems to correct the laxative properties possessed by the pear.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By J. F. BAILEY and C. T. WHITE.

No. 2.

CASSIA OCCIDENTALIS, *Linn.* (ORDER LEGUMINOSÆ).

COFFEE SENNA.

CASSIA OCCIDENTALIS, Benth. (Plate 2.)

Annual or of two or three years' duration, often forming dense bushy masses a few feet in height, glabrous or nearly so. Stem erect, firmly herbaceous or woody below. Leaflets 4-5 pairs, ovate or elliptic-lanceolate, usually acute or acuminate, glabrous or minutely ciliolate or pubescent beneath, 1½-2½ in. long, the upper ones sometimes varying from 3-4 in., common petiole with a short obtuse gland near the base. Stipules lanceolate or ovate-lanceolate, membranous, deciduous. Flowers in short few-flowered axillary racemes or fascicles, peduncles of pedicels seldom exceeding 1 in., or towards the ends of the branches the fascicles confluent, forming an interrupted terminal raceme, the leaves reduced or bract-like. Bracts thin, linear-lanceolate or oblong, deciduous. Sepals obtuse, glabrous or nearly so, the outer rather shorter. Petals obtuse, venose. The two anterior stamens larger than the others with slightly curved anthers. Pod 2-valved, linear, compressed, slightly falcate or straight, apiculate, 3½-5 in. long, 3-4 lines broad; depressed between the seeds when dry.

Probably of American origin but now widely spread throughout the tropical and sub-tropical regions of the globe.

As far back as 1888 this plant was recorded as having run out on the Endeavour River; of recent years the plant has established itself and become more or less of a nuisance in various localities in Queensland, and is a common weed in the Brisbane district. It has several times been sent in as a suspected poisonous plant; it belongs to the same genus as the Senna of commerce, and any harm it may have on stock would be of a purgative nature.

We know of no local name applied to the plant in Queensland; in the United States of America it goes under the name of "Coffee Senna."

The above description and accompanying plate should aid in its recognition.

USES.

"A common tropical weed which has been variously reported from the West Indies and Florida as a coffee substitute. In Porto Rico this idea has long been prevalent, and the seeds are regularly on sale in the markets. Analysis has failed to find caffein or any similar alkaloid, and the coffee must be ranked with that made from burnt peas and the like. Tonic and febrifugal properties have been ascribed to this drink, and it has also been used as a coffee adulterant."—Cook and Collins, "Economic Plants of Porto Rico," pp. 108-9.

PLATE 2.—CASSIA OCCIDENTALIS, *Benth.*

"The seeds sometimes called 'negro coffee' are used in some parts of the world as a substitute for coffee, and are said to be a febrifuge. The plant has been used as a remedy for stomach troubles, nervous asthma, and typhoid fever. The root is especially active, and the leaves are used medicinally in many countries, especially in Dahomey, Africa, where they are one of the most important drugs used in the hospitals in the treatment of certain fevers; they are purgative and antiherpetic."—W. E. Stafford, "The Useful Plants of the Island of Guam," pp. 218-9.

Eradication.—Hoe or pull the plants up when young or before seeding; if the plants have become large or woody, cut off below the surface of the soil and burn when dry.

THE SUGAR-CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following monthly report from Mr. E. Jarvis, Entomologist to the Bureau:—

On the 8th November 2½ in. of rain fell over the Babinda Area, and the following evening cane beetles made their appearance in enormous numbers, justifying previous conclusions with regard to the probability of emergence being exceptionally early this season on account of the drought.

At Deeral and McDonal's Creek three distinct kinds were in evidence, the most plentiful being *Lepidiota caudata,* Watern., a dark reddish-brown species very similar in shape to the mealy-backed cane beetle, but slightly smaller, although considerably larger than *L. frenchi. Caudata* probably breeds extensively in scrub lands, where I am inclined to believe it does as much if not more damage to cane than our Notorious Cockchafer (*Lepidiota albohirta*), Watern. Its near relationship to the latter species, together with its prolificness and the larger size and voracity of its grub, all point to the possibility of its becoming of considerable economic importance.

It is proposed to make a special study of the larval stage of this pest during the coming season.

The two other cane-beetles associated with *Caudata* at Deeral were *L. albohirta* and a Shining Golden-green Beetle (*Anoplognathus sp.*), closely allied to our so-called "Chirstmas Beetle," but much smaller.

Although previously recorded from canefields, this beautiful insect cannot at present be justly included in our list of Scarabæidæ attacking sugar-cane, and is not likely to become troublesome in the future.

Weather conditions at Gordonvale are unchanged, little or no rain having fallen here during this month (October).

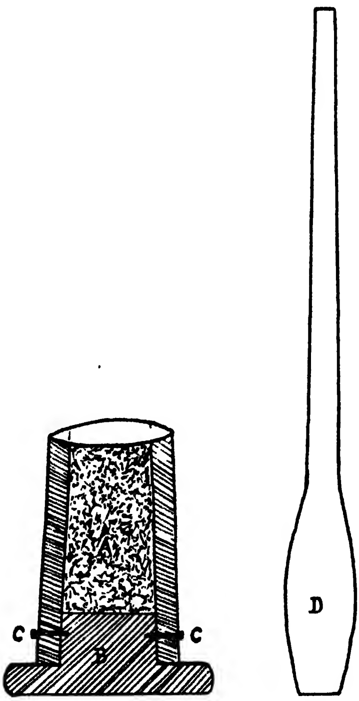
In spite of abnormal dryness, however, beetles that transformed about the middle of September have managed to keep alive for over six weeks, and are still lying in their pupal chambers at a depth of 9 in. to 1 ft. below the surface of the ground.

Unless heavy rain softens the soil before the end of November, a large percentage of these beetles may perish; and those able to emerge, being much weakened, lay fewer eggs than usual.

General Notes.

A HOME-MADE RICE MILL AND CORN-CRACKER.

Circumstances frequently demand the ingenuity of farmers in isolated districts in manufacturing implements and machinery for use where certain crops are not large enough to warrant much expenditure of capital. Many years ago—in days of small sugar-mills—we came across a farmer who had grown 3 or 4 acres of cane far away from any



A.—Length from a hollow tree. B.—Ironbark plug. C.C.—3-inch screws. D.—River Gum pestle.

mill. He constructed a rude mill with three vertical wooden rollers, which were set in motion by two horses. With this primitive appliance, he succeeded in taking off his crop; and, with other crude appliances, he made a saleable dark sugar. Needless to say that over 50 per cent. of the sugar content of the cane went into the megass heap.

In the case of rice, there are up-to-date rice mills, which husk and polish the paddy, turning out a fine quality of white rice.

The accompanying sketch gives an idea of how paddy may be husked to the extent of producing red rice. Mr. J. F. Keane, Carbeen, near Cairns, where in past years rice was largely produced and milled, sends

us the following description of his home-made appliance for preparing the paddy for domestic use:—

"A large wooden mortar and pestle is to be seen about every hut throughout India and China used in preparing grain for diet. They vary a good deal in size and pattern, but always, so far as I have seen, appear to be turned, bored, or burnt out of the solid block. Some appear as though they could claim considerable antiquity.

"The design I enclose is of a makeshift of my own contriving. It has been in almost daily use for three years, and from all appearances might last a hundred.

"The bowl or vessel portion is made from a piped poplar gum with an ironbark bottom, and the river gum Indian club weighs about 10 lb.

"In hulling paddy, place the mortar on firm level ground; put not less than three pints of paddy in it, and beat it with the Indian club; hit as hard as you can, as it is like pounding a feather pillow. After about a minute's braying, the sound will have gradually changed from a rustle to a thud. Tip out the grist into a pan; hold it high and pour on to a sheet in the wind. Rice winnows very freely, the slightest breath of air carrying the chaff far away. Repeat the process twice more, and the rice will be ready for cooking.

"It is not necessary to bray so hard towards the end. You will soon get into all its little ways.

"As this process removes very little of the red inner skin or bran of the grain, it is known to commerce as red rice, and is the only kind that is eaten by the nations subsisting almost wholly on rice. A man at the Indian club, with a boy or woman to winnow, can put through about 20 bushels of paddy a day. The winnower empties and feeds, so keeping the Indian club going almost uninterruptedly.

"To crack maize, put not less than a quart of grain in the mortar and bray with the club, using no force, merely allowing the club to fall by its own weight. In about a minute there will be very few whole grains left in the mortar. Tip out into a sieve with $\frac{1}{8}$ in. openings. What shakes through is suitable for all the purposes to which maizemeal can be put. What remains is cracked corn for fowls or stock. This corn-cracker does its work about four times as fast as any of the manual machines sold can do it."

[The implement here described is the one most commonly used by the natives of India. It is called the "ukhli," and is used for hulling or removing the husk of the paddy. Another form called the "dhekoli" consists of a heavy beam or round log of timber, about 8 feet long, and weighing 300 lb. Into one end is fixed a short block shod with iron, and the centre of the beam rests on a crossbar to which it is fixed on two uprights sunk in the ground. The iron-shod block rests in a stout wooden cup sunk below the level of the ground. The contrivance is worked by one or two persons pulling down the free end of the log, and suddenly letting go, when the shod end drops into the cup holding the paddy. One person keeps constantly pushing back the grain as the pounding goes on. These primitive methods of preparing rice are

slow and tedious, especially as the paddy first passes through a soaking process for forty-eight hours, is then steamed, dried for two or more days in the sun, and then pounded in the mortar as shown. Three bushels of paddy when thus husked will give two bushels of rice. Such unremunerative labour, as may well be imagined, would not appeal to the Queensland rice-grower.—Ed. "Q.A.J."]

SHEEP AND DOG PROOF FENCES.

In reply to a correspondent, Mr. W. G. Brown, Instructor in Sheep and Wool, advises as to such fences as follows:—

There is no reasonably cheap fence which is proof against crossbred sheep, excepting some form of netting. With Merinos it is different, for an ordinary 6-wire plain fence with 10-ft. panels is quite efficient. I do not advocate barbed wire in the lower parts of any fence for sheep. Crossbreds will poke through, or try to, wherever there is any appearance of an opening. This for the sheep side of the question. To make a fence dog-proof, it is absolutely necessary to use netting—27-in., 3-in. mesh, 17 or 16 gauge, with a tightly-stretched barbed wire running along the ground as closely as possible. Above this netting, ordinary cheap 4-ft. marsupial netting should be placed. The panels should be about 10 ft., with posts 20 in. in the ground and 5 ft. 6 in. over all, every other post being 2 ft. longer to carry the marsupial netting. This is an expensive fence, yet in dog-infested lands will pay for itself in twelve months, if 1,000 sheep are carried.

WATER DIVINING.

THE DISCOVERY OF SALT AND FRESH WATER.

Mr. A. Morry, Surveyor to the Department of Agriculture and Stock, who has been very successful in locating underground streams of water by means of the forked rod and the automatic water-finder, tells of a significant discovery he accidentally made when locating subterranean water. It frequently happens that the instruments indicate the presence of water; but the operator has no means of knowing whether that water is fresh or salt without first boring or sinking a well. As explained by Mr. Morry in articles written by him on the subject, and which were published in this Journal some three years ago, he held that all underground streams flow either direct to the ocean or to the nearest rivers or lakes. He, therefore, made an examination of the high and low lands in the neighbourhood of "Hominy" or "Omaney" Mount, on the Brisbane River, fully expecting to obtain fresh water on the flat near the river. He found, however, that a hole had been sunk there, and the water found proved to be salt. He then tested the gravel bed running parallel with the river for about 100 yards. The rod gave very lively indications the whole length of the bed; but, as he could not trace any further streams coming from the high ground, he concluded that the

gravel bed contained river water which had percolated through the sand and gravel, and which was slowly moving with the receding tide. Whilst thinking the matter over, Mr. Morry took a few coins from his pocket, unconsciously playing with them. He was surprised to find that whilst these coins remained in his hand the action of the rod ceased; but, on going to a spot where he believed fresh water existed, the action of the rod was as lively as ever, even though the coins were still retained. Thus it was established that at some points the existence of the coins in the hand was sufficient to stop the action of the rod, whereas at other spots no difference was perceptible. Concluding that herein was a clue to the existence of fresh water in the one place, and salt in another, he made a number of tests with similar results in every case. A 2-in. auger was then obtained, and holes bored at two of the spots so indicated, with the result that fresh water was found in one bore about 6 ft. below the surface, and salt in the other, just as was expected from the indications supplied by the rod. This test, should it prove its infallibility after further experiment, should prove of very great value. particularly in localities such as the Woongarra Scrub, where wells were sunk to a great depth, only resulting in some cases in reaching salt water.

Many years ago (1864), at Oxley Creek, in the locality of what is now Corinda, there was no surface water, and the few settlers (then numbering about half a dozen) had to carry buckets of water from a hole somewhere near what is known as the "Blunder." The writer came to the conclusion that water could be found at a shallow depth on his farm ("Wealwandangie"). A dozen farmers, one day, held a well-sinking bee in a gully close to the main road between Oxley and Sherwood. At 15 ft., limestone boulders were met with, beneath which a splendid supply of sweet water was struck. On the other side of the road, in a corner of what was known as Donaldson's Paddock, the late Rev. Wm. Gray, of Consort Cliff, sank a hole about 4 ft. deep, and struck a strong spring of very clear mineral water much like the present Helidon Spa Water. It would be interesting if our water diviners were to exercise their undoubted power in the Oxley district, and particularly at Corinda. Mr. G. B. Brookes, Instructor in Agriculture, is amongst the successful of those who have the gift of discovering underground water; and the question as to the possibility of locating fresh and salt water springs has been discussed between him and Mr. Morry, and we shall doubtless soon hear of further developments in this direction.

TO CLEAR MUDDY TANK WATER.

When the water in an excavated tank is muddy, the addition of a small amount of lime (prepared from quicklime by slaking with water) will most likely clear such muddy water. Alum is frequently used for the same purpose, but only in small amounts of water. This can easily be verified by putting a small pinch of alum in a glassful of muddy water. All the dirty flocculencies will be precipitated, leaving the water perfectly clear.

Answers to Correspondents.

BERSEEM.

WESTERN GRAZIER, Townsville—

Under the title "Berseem" are included various kinds of clover grown in Egypt. They are all varieties of *Trifolium alexandrinum.* It possesses several valuable properties:—(1) It tends to prevent the diminution of the store of humus in the soil. (2) It is very useful in opening up the soil, an essential point in the successful cultivation of some succeeding crops. (3) It possesses a high manurial value for the crops which follow it, because, in common with other members of the order Leguminosæ, it possesses the power of absorbing the free nitrogen of the air, and converting it into plant food. An average crop contains 384 rottles of nitrogen, and the roots 60 rottles. The great rottolo of Alexandria and Cairo equals about 2 lb. English. The following account of the properties of Berseem published in this Journal in June, 1904, may interest you:—

MAKING BARREN LAND FERTILE.

It has always been accepted as a fact that the great fertility of the soil bordering the Nile is due to the rich silt brought down from the mountains during the annual overflow of the river. This would now appear to be one of the many delusions of our youth, if the reported discovery by a party of experts sent to Egypt by the United States Department of Agriculture is to be credited, and there is no reason to doubt that the Department has made a discovery which may have a very world-wide influence on the agricultural industry. It seems that, instead of the fertility of the Nile soil being due to the deposit of silt, it is really the effect of a plant called "Berseem." This is a species of *Trifolium* which has the power of reclaiming barren soils by absorbing the saline and alkaline properties of the land, of enriching it with nitrates, and maintaining it in a productive state. It also possesses the remarkable power of destroying most other weeds, and the experts state that they rode through miles of fields of Berseem in which scarcely a weed was to be seen. This *Trifolium* is a composite between lucerne and clover, and it is in every way more delicate and succulent than either. It is greatly relished by stock of all kinds, such as horses, cattle, camels, and donkeys, and even the fellaheen or peasants use it as an article of food. Should this discovery be confirmed by experiments which are now being made, it cannot but prove a most valuable one to the agricultural world. There is, however, to our thinking, a "fly in the ointment" in that, if the plant has the singular power of destroying many kinds of weeds, it may also turn out to be destructive of economic plants, in which case its introduction into our State would, instead of

being a blessing, turn out to be a more terrible enemy than dodder, nut grass, lantana, or prickly-pear. For it must be remembered that weeds are merely plants in the wrong place. Oats growing up in manure placed on land become weeds. We may, however, rest assured that the United States Department of Agriculture is too wideawake to introduce such a plant to American soil without making exhaustive experiments to determine this important point.

LAYING POISONED BAITS.

A correspondent asks—

"Can a man legally use poison for the destruction of vermin? If this question is too vague, I would ask: Can a man lawfully cyanide some bread and put the poisoned pieces among his garden crops where they would be eaten by the ants and bandicoots?

"If his neighbour allows his dogs, fowls, and poddy calves to trespass so that they also eat of the poison, has the neighbour any right to claim compensation?"

These questions were answered in the "Brisbane Courier" last month as follows:—

"The matter involves an intricate legal question. It may be stated that in Townsend *v.* Wathen, 9 East, 277, it was held that if a man places traps baited with flesh on his own ground so near to the premises of another that dogs kept on the neighbour's premises would probably be attracted by their instinct into the traps, and if in consequence his neighbour's dogs are so attracted and injured, an action lies. In Ponting *v.* Noakes, 2 Q.B., 281, in 1904, it was shown that a horse consumed leaves from a yew-tree, the branches of which extended over or up to the fence of the plaintiff's property, but the defendant was not held liable, because there was no duty on him to prevent the plaintiff's horses from having access to the tree."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1915.

Article.		DECEMBER. Prices.
Bacon	lb.	1s. 1d. to 1s. 3½d.
Bran	ton	£6 5s.
Broom Millet	"	£37
Butter	cwt.	149s. 4d.
Chaff, Mixed	ton	...
Chaff, Oaten	"	£12 10s. to £13 10s.
Chaff, Lucerne	"	£17 10s. to £18 15s.
Chaff, Wheaten	"	£8 to £8 10s.
Cheese	lb.	11¼d.
Flour	ton	£12 10s.
Hams	lb.	1s. 3d. to 1s. 4½d.
Hay, Oaten (Victoria)	ton	£12 to £16
Hay, Lucerne	"	£11 to £13
Honey	lb.	3d. to 3½d.
Maize	bush.	5s. 9d. to 6s. 10d.
Maize (Green Stalks)	ton	35s. to 42s.
Oats	bush.	4s. 9d. to 5s. 3d.
Onions	ton	£6 10s. to £8 10s.
Peanuts	lb.	3d. to 4½d.
Pollard	ton	£8
Potatoes	"	£20 to £25 10s.
Potatoes (Sweet)	cwt.	3s. to 8s.
Pumpkins	ton	£15
Eggs	doz.	1s. 4d. to 1s. 9d.
Fowls	pair	3s. 3d. to 4s. 3d.
Ducks, English	"	4s. to 5s.
Ducks, Muscovy	"	6s. 6d.
Geese	"	10s. to 12s.
Turkeys (Hens)	"	10s. to 12s.
Turkeys (Gobblers)	"	18s. to 23s.
Wheat (Chick)	bush.	5s. 9d.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	6s. to 12s. 6d.
Beans, per sugar bag	8s. to 12s.
Beetroot, per dozen bunches	1s. to 1s. 3d.
Carrots, per dozen bunches	1s. to 1s. 3d.
Chocos, per quarter-case	2s. 6d. to 4s.
Cucumbers, per dozen	10d. to 4s. 6d.
Custard Marrows, per dozen	5s. to 8s.
Vegetable Marrows, per dozen	5s. to 8s.
Peas, per sugar bag	10s. to 12s. 6d.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	1s. 3d. to 1s. 6d.
Sweet Potatoes, per cwt.	3s. to 5s.
Table Pumpkins, per dozen	7s. to 11s.
Tomatoes, per quarter-case	3s. 6d. to 7s.
Turnips, per dozen bunches	1s.
Rhubarb, per dozen bundles	1s. 3d. to 1s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	DECEMBER. Prices.
Bananas (Queensland), per case	13s.
Bananas (Fiji), per case	23s.
Bananas (G.M.), per case	21s. to 22s.
Bananas (G.M.), per bunch	...
Mandarins, per case	...
Mangoes, per case	10s. to 12s.
Oranges (Navel), per case	20s. to 25s.
Oranges (other), per case	12s. to 20s.
Passion Fruit, per quarter-case	4s. to 5s.
Lemons (Local), per bushel case	10s. to 16s.
Papaw Apples, per double-case	6s. to 7s.
Pineapples (Queens), per case	12s. to 13s.
Pineapples (Ripleys), per case	9s. to 10s.
Pineapples (Common), per case	9s. to 10s.
Strawberries (Queensland) per tray	...
Tomatoes, per quarter-case	4s. to 6s.
Cucumbers, per case	12s. to 15s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	DECEMBER. Prices.
Apples (American), per case	16s. to 19s.
Apples, Cooking, per case	12s. to 16s.
Apricots, per quarter-case	9s. to 11s.
Bananas (Cavendish), per dozen	1½d. to 4½d.
Bananas (Sugar), per dozen	1d. to 3d.
Cherries, per case	12s. to 24s.
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	...
Granadillas, per quarter-case	...
Lemons (Lisbon), per case	8s. to 12s.
Limes, per quarter-case	3s. to 4s.
Mandarins, per half-case	3s. 6d. to 5s. 6d.
Mangoes, per case	12s. 6d. to 13s. 6d.
Oranges (Navel), per case	8s. to 12s.
Oranges (other), per case	8s. to 12s.
Papaw Apples, per quarter-case	3s. 3d. to 4s.
Passion Fruit, per case	2s. to 5s.
Peaches, per case	5s. to 9s.
Peanuts, per pound	3d. to 4½d.
Plums, per case	6s. to 10s. 6d.
Rosellas, per sugar bag	...
Pineapples (Ripley's), per dozen	5s. to 7s.
Pineapples (Rough), per dozen	2s. to 6s.
Pineapples (Smooth), per dozen	5s. to 7s.
Rockmelons, per dozen	4s. to 8s. 6d.
Strawberries, per dozen pint boxes	8s. to 10s.
Strawberries, per tray	...
Tomatoes, per quarter-case	4s. to 6s.
Watermelons, per dozen	3s. 6d. to 9s. 6d.

TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1915.

Animal.	NOVEMBER. Prices.
Bullocks	£19 17s. 6d. to £26 2s. 6d.
Bullocks (Single)	£30 10s.
Cows	£16 17s. 6d. to £20 2s. 6d.
Merino Wethers	30s. 6d.
Crossbred Wethers	30s.
Merino Ewes	26s. 9d.
Crossbred Ewes	40s.
Lambs	28s.
Pigs (Porkers)	37s. 6d.

LONDON QUOTATIONS.

The Liverpool quotations for middling Uplands American cotton, December-January shipment, is 7.28½d. per lb.

Jute: December-January shipment, from Calcutta, £25 15s. per ton.

Hemp: January-March shipment, £36 10s.

Rubber: Fine hard Para, 2s. 11½d. per lb.; plantation, first latex crepe, 3s. 5½d.; smoked sheet, 3s. 6d.

Copra: South Sea, December-January shipment, £29 10s. per ton.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1915 AND 1914, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1915.	Nov., 1914.
North Coast.	In.		In.	In.
Atherton	2·01	13	1·68	0·75
Cairns	4·06	27	1·51	3·48
Cardwell	4·65	27	3·20	2·17
Cooktown	3·13	27	0·61	2·81
Herberton	2·59	27	0·50	0·61
Ingham	4·09	22	0·51	1·62
Innisfail	6·98	27	0·37	4·24
Mossman	6·12	5	1·66	5·30
Townsville	1·89	30	0·33	0·13
Central Coast.				
Ayr	1·45	27	0·12	Nil
Bowen	1·29	27	0·86	1·06
Charters Towers ...	1·57	27	0·04	Nil
Mackay	2·45	27	7·16	1·10
Proserpine	3·47	11	1·14	1·36
St. Lawrence ...	2·12	27	4·64	0·27
South Coast.				
Biggenden	2·45	14	2·40	1·31
Bundaberg	2·39	27	1·08	0·53
Brisbane	3·56	64	2·46	0·59
Childers	2·75	19	0·63	0·53
Crohamhurst ...	4·35	22	4·21	3·30
Esk	3·02	27	3·62	0·75
Gayndah	2·54	27	2·82	0·96
Gympie	2·88	27	5·19	1·68
Glasshouse M'tains	3·97	6	1·72	1·95
Kilkivan	2·50	27	1·13	0·12
Maryborough ...	2·80	27	1·25	0·54
South Coast—continued:	In.		In.	In.
Nanango	2·35	27	1·59	0·48
Rockhampton ...	2·12	27	2·62	0·68
Woodford	2·98	27	2·74	1·52
Yandina	3·50	21	4·04	1·67
Darling Downs.				
Dalby	2·47	27	0·82	0·65
Emu Vale	2·72	17	0·03	0·56
Jimbour	2·47	24	0·91	0·54
Miles	2·35	27	0·69	1·31
Stanthorpe ...	2·75	27	0·14	2·13
Toowoomba ...	3·06	27	1·34	0·75
Warwick	2·61	27	0:05	1·05
Maranoa.				
Roma	2·13	25	0·99	1·36
State Farms, &c.				
Gatton College ...	2·71	14	0·76	0·88
Gindie	2·06	13	1·01	Nil
Kamerunga Nurs'y	3·22	23	1·82	2·68
Kairi	0·87	3	0.89	0·17
Sugar Experiment Station, Mackay	2·50	16	5·22	1·14
Bungeworgorai ...	...	...	0·55	1·23
Warren	...	...	2·98	Nil
Hermitage ...	2·81	7	0·09	1·20

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year and for the same period of 1914, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE FIRST FOUR MONTHS OF 1916.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·58	5·46
2	4·57	6·45	5·21	6·42	5·42	6·18	5·59	5·45
3	4·58	6·45	5·22	6·41	5·43	6·17	5·59	5·44
4	4·58	6·45	5·22	6·41	5·43	6·16	6·0	5·43
5	4·59	6·45	5·23	6·40	5·44	6·15	6·0	5·42
6	5·0	6·46	5·23	6·39	5·45	6·14	6·1	5·40
7	5·0	6·46	5·24	6·39	5·45	6·13	6·1	5·39
8	5·1	6·46	5·25	6·38	5·46	6·12	6·2	5·38
9	5·1	6·46	5·26	6·37	5·46	6·11	6·2	5·37
10	5·2	6·46	5·27	6·37	5·47	6·10	6·3	5·36
11	5·3	6·46	5·27	6·36	5·47	6·9	6·3	5·35
12	5·4	6·46	5·28	6·35	5·48	6·8	6·4	5·34
13	5·5	6·46	5·29	6·35	5·48	6·7	6·4	5·33
14	5·6	6·46	5·30	6·34	5·49	6·6	6·5	5·32
15	5·7	6·46	5·30	6·33	5·49	6·5	6·5	5·31
16	5·8	6·46	5·31	6·32	5·50	6·4	6·6	5·30
17	5·8	6·47	5·32	6·31	5·50	6·2	6·6	5·29
18	5·9	6·47	5·32	6·31	5·51	6·1	6·7	5·28
19	5·9	6·47	5·33	6·30	5·51	6·0	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·8	5·26
21	5·11	6·46	5·34	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·35	6·27	5·53	5·57	6·8	5·24
23	5·13	6·45	5·36	6·26	5·53	5·56	6·9	5·24
24	5·13	6·45	5·37	6·25	5·54	5·55	6·9	5·23
25	5·14	6·45	5·38	6·24	5·54	5·53	6·10	5·22
26	5·15	6·45	5·38	6·23	5·55	5·52	6·10	5·21
27	5·16	6·44	5·39	6·22	5·55	5·51	6·11	5·20
28	5·17	6·44	5·40	6·21	5·56	5·50	6·11	5·19
29	5·18	6·44	5·41	6·20	5·57	5·49	6·12	5·18
30	5·19	6·43	...	...	5·57	5·48	6·12	5·18
31	5·20	6·43	...	...	5·58	5·47	...	...

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H. M.
5 Jan.	●	New Moon	2 45 p.m.
12 „	☾	First Quarter	1 38 „
20 „	○	Full Moon	6 29 „
28 „	☽	Last Quarter	10 35 a.m.

The moon will be partially eclipsed between 6 p.m. and 7·24 p.m. on January 20th. It will be at its nearest to the earth on the 4th at midnight, and at its greatest distance on the 17th at 3 p.m.

4 Feb.	●	New Moon	2 6 a.m.
11 „	☾	First Quarter	8 20 a.m.
19 „	○	Full Moon	12 29 p.m.
26 „	☽	Last Quarter	7 24 p.m.

The moon will be at its nearest to the earth on the 2nd at 10 a.m., and at its farthest on the 14th at 7 a.m. It will pass very close to the Pleiades on the 11th about midnight.

4 Mar.	●	New Moon	1 58 p.m.
12 „	☾	First Quarter	4 33 a.m.
20 „	○	Full Moon	3 27 „
27 „	☽	Last Quarter	2 22 „

The moon will be farthest from the earth on the 13th at 3 a.m., and nearest on the 26th at 11 p.m. It will pass over and occult the bright star, Antares, on the 25th between 4 a.m. and 5 a.m.

3 Apr.	●	New Moon	2 21 a.m.
11 „	☾	First Quarter	12 36 a.m.
18 „	○	Full Moon	3 7 p.m.
25 „	☽	Last Quarter	8 38 a.m.

The moon will be farthest from the earth on the 9th at about midnight, and at its nearest on the 21st at 9·36 p.m. It will be near the planet Neptune on the 11th at 7·30 p.m., but a good glass will be necessary to see the planet which will be rather more than the width of the moon to the south.

A total Eclipse of the Sun will occur on Feb. 3rd, visible in parts of Central and South America, in parts of the Pacific and Atlantic Oceans, and partially only in Great Britain, France, Spain, &c.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 17 m., 28 m., 36 m., and 47 minutes, respectively, later than at Brisbane at this time of the year.

At Roma 15 minutes may be added to the Brisbane times for January and February, and about 17 minutes for March and April.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangelwurtzels.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on "Market Gardening" issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, and are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candy-

tuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstamons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the "Agricultural Journal" might be rendered of more value to our fruit-growers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pineapples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is

thoroughly prepared—viz., well and deeply-worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop

of fruit ripening towards the end of winter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes, ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the State. For long shipment nothing can beat crates holding 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SETTLEMENT AND IMMIGRATION.

Writing on this subject in October last year "The Farmers' Advocate," Johannesburg, Transvaal, South Africa, says that some may be of opinion that a negative to immigration aspirations is being furnished by the course of the present disastrous war which threatens to decimate the male population of Europe. History suggests, however, the converse result. Bloodier as this war is than the Napoleonic wars, nobody supposes that it will destroy any large percentage even of the males belonging to the belligerent nations. Looking to the United Kingdom, and supposing (which may Providence forfend) that the whole of its existing levy of about three million men were blotted out the loss to the British nation would be qualitative rather than quantitative. The best of the males, as a whole, would have gone, but the most of them would remain. Even this depletion, bad as it would be, would only affect the

generation between the ages of 18 or 19 and 40. The lads and girls below these ages would grow up in undiminished numbers and speedily restore to the nation its wonted numbers. Malthus has left on record with what celerity the population of certain parishes in Scotland, depleted towards the close of the eighteenth century, alike by war and immigration, restored itself. His deduction, consonant with the teaching of all sociological science, was that artificial checks of the kind above instanced, restrict for only a brief period the multiplication of the human species where the means of subsistence continue unreduced. War, however, has an aftermath of economic unsettlement which is peculiarly stimulative of emigration from the countries it has afflicted. South Africa, prior to the discovery of the diamond and gold fields, owed indirectly to the Napoleonic conflict the presence within its territory of the bulk of its English population. These for the most part, traced their origin to the Albany immigrants of the year 1820, themselves mainly driven from their native land by the hardness of the economic conditions —the destruction of capital and consequent shortage of business and employment which were the natural sequel to the century or so of exhausting struggle wherein England had been engaged. Like results may be expected from the present war, as much more acute as it is to be trusted it will be briefer than the other. And as an added factor of immigration we must include that tendency of a military career which makes it difficult for men who have tasted its excitements to settle down again in the monotonous routine of a crowded old-world civilisation, but, rather drives them abroad in the hope of making homes and a competence in the roomier sphere of some new country.

The men will probably come to us after the war. Shall we prepare or not to receive them? Some of them will bring capital as well as constitution and character, and for these the State needs to make little or no provision beyond that provision of scientific and practical advice which the experts of the Agricultural Department already so willingly give. Such men will acquire land and develop it otherwise unaided. As to a large residue of the future immigrants who will have the constitution and the character without much cash, the option for us already in the country appears to be that they shall either swell the unemployed and, in the end, unemployable class in the towns or be assisted to benefit themselves and us by becoming producers on the soil. If the latter is to be our policy we can only give it effect by means of the "prepared" farm. South African readers do not require to have it explained to them how disastrous it would be to dump oversea men without capital or, for that matter, penniless men of the country, on dry bare veld. The methods which the Land Settlement Department is already adopting must be persevered in, but upon a much bigger scale. A hundred bore holes must be sent down where we have been sinking one, and housing and fencing operations in behalf of the prospective settlers will need to be similarly multiplied. No doubt the good land is expensive; mostly it cannot be bought under £5 per morgen,* and of the Crown lands little,

* The Cape morgen is reckoned equal to 2·11654 acres.

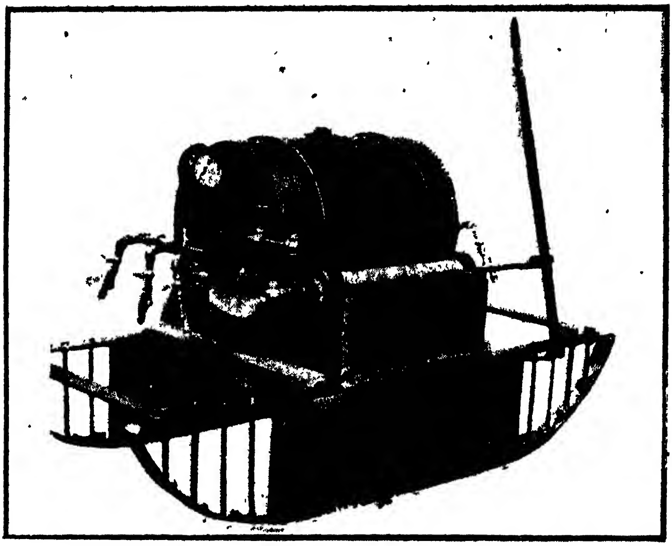

PLATE 2A.—WEED-KILLING MACHINE.

unfortunately, is adapted to close settlement. If we want really to grapple with the problem of preserving our heritage as a white people, making "scour" to cease and robbing the native problem of its menace, we should devote a great State loan to immigration of the large kind.

WEED-KILLING BY MACHINERY.

It has been generally accepted that the application of arsenical solutions for the destruction of weeds amongst growing crops is destructive to the crops, and prevents the growth of plants on the affected soil. This has apparently been disproved, as will be seen by the following account of the destruction of weeds in canefields, which the "Australian Sugar Journal" reprints from a special edition of the "Honolulu State Bulletin":—

"The Olaa Sugar Company is putting into extensive use a new method of destroying weeds in the canefields. An arsenical spray is applied by means of a specially constructed sled carrying a tank fitted with nozzles, through which the liquid is expelled under air pressure downward and directly upon the weeds between the cane rows. One man with a mule operates the contrivance. The solution is composed of a mixture of arsenite of soda and caustic soda, there being about 5 lb. arsenic to 100 gallons of the solution. By this means the cost of weed destruction at Olaa has been reduced by 25 per cent.; the cost of spraying per acre for a single application is said to be about one dollar. The great saving found in the use of this spray is in the control it gives of the weed growth between the cane rows. The cane being less hampered, the tops meet sooner across the space between the rows, shading the ground and retarding the weed growth earlier in the life of the crop than would otherwise be the case. Various tests made show that no harmful results accrue from the application of arsenic to the soil. It is demonstrated that if all the arsenic that would be used in sixty years of such application were given in one dose, no harmful results to the soil would follow. It was shown also that no retardation in the growth of the cane was occasioned. Care, however, is taken to prevent the spray coming into contact with the cane leaves. Besides the mule-drawn sled, spraying for weed destruction is also accomplished with hand sprayers carried on the shoulders of labourers."

POTATO CULTIVATION.

Potato planting in the Southern districts will be general during this month, and success will depend largely on the character of the land and the season experienced, the chief factor lying in its proper preparation some time before planting. Hurriedly prepared fields are only courting a partial failure or a serious reduction in the yield. After a few years of general cropping the texture of the soil undergoes a change, detrimental to the crop, unless especial care has been taken to prepare the land

some months before planting, the primary object being to bring the soil to a good tilth, and the secondary the retention of moisture for the approaching planting season and the subsequent development of the crop. To effect this, the cultivation should be deep and in accordance with the nature of the soil.

Very heavy crops have been obtained in old lucerne fields, but in this case, after breaking up, ample time must be allowed for the weathering and mellowing down of the soil. If this is not done, the soil particles for the most part remain about the size of peas, and are incapable of retaining moisture for any length of time, to the consequent reduction of the crop.

Preparation of the Soil.—Whilst the successful raising of marketable crops is dependent largely on the character of the land and the season experienced, the factor in chief lies in its proper preparation.

Hurriedly prepared fields are only courting a partial failure or serious reduction in yield.

Generally speaking, the heaviest falls of rain come in the latter end of the summer, and the winter months are inclined to show averages slightly below normal. Assuming that it is intended to take advantage also of the mellowing and sweetening influences of frost, and plant immediately it is safe after the winter, it is imperative that on virgin soils, apart from scrub land, the work of preparation should extend over several months. Operations should be directed in accordance with varying local conditions, but it remains that certain fixed objects must be kept in view—the primary one being tilth, and the secondary a retention of moisture for the approaching planting season and the development of the crop. Any encroachment of weeds or grass on the "fallowing" land will have as its corollary an unsatisfactory condition for all subsequent operations, and, if fouled in this way, the work of the potato-digger is very much hampered.

Cultivate deeply and in accordance with the nature of the soil. On virgin land shallow "breaking up"—say, in October or early November—with an English type mould-board plough to invert the furrow slice, is commended. Should couch be present, the surface must be worked consistently during the hot weather with the disc and tine harrows to give all the exposure possible to dry it out. If otherwise, roll after the plough, and harrow to fill the interstices between the furrows.

Use the disc harrows just previous to cross ploughing, which should be carried out as soon as grass has rotted down sufficiently, and to a depth of not less than 6 in., which should be increased gradually in the seasons following.

Selection and Condition of Seed.—No matter how well the land has been prepared, if the sets are inferior in quality, a full return cannot be expected; the selection of suitable seed apart from variety has an important bearing upon the success of a crop.

Select from a variety true to type, well grown, uniform in character, and having a clean skin and free from disease (see specific for the

disinfection of seed potatoes under the heading of "Diseases"); flesh should be firm to the touch, but yielding slightly under pressure.

The eyes require to be almost level with the surface in most varieties, and particular attention directed to the condition of the buds or young shoots. Sets in a condition to plant should have short robust sprouts; those showing a long or attenuated growth are to be avoided.

Storage in large heaps and a lack in turning the potatoes encourage this condition. Shallow layers are to be preferred, with frequent turning, and the picking out of any showing traces of rotting.

The sets for planting are either tubers too small for table use—but graded from a good crop—or those of ordinary commercial size and which have to be cut into sections.

It is generally recognised that, for conditions prevailing over most of the State, whole sets are preferable. Exceptions are to be considered in the event of a possibility of the introduction of disease, when an additional precaution may be taken by cutting, when detection is easier.

For the autumn planting, whole seed is certainly to be recommended. The reason for this lies in the fact that, if wet conditions follow after the planting of cut sets, accompanied by warm weather, the planting may be lost by rotting.

The safest season for "cut" seed is for the August or spring planting, when the soil is colder and generally not so moist.

If whole sets be used, care should be taken to procure from a reliable grower or reputable seed firm.

Very small whole potatoes are not likely to give the same results as a more robust sample about 2 in. in diameter. This latter carries a store of nourishment for the young plant, tides it over a dry time, and gives it an earlier start.

For cut seed, moderately sized tubers are to be preferred; nothing is to be gained by making small sets for reasons similar to above, and they are relatively more subject to rot.

Number of Eyes to Set.—Much importance is often placed as to the number of eyes that should be set, but this is of much less value than the size of set. Where several eyes may inadvertently be left on a cut set and these start simultaneously into life, or when whole potatoes are used and planted at a seasonable time, the primary shoot assumes control and gives rise generally to one stem. Exceptions occur in backward seed or if planted late in the spring, and when humid weather is experienced; then considerable suckering takes place.

Cutting Seed.—As to the best method of cutting the tuber into sets, it will be observed that at one end of the potato, in most varieties, there is a bunch of eyes called "the crown." In the case of the smaller-sized potatoes all that is necessary is to cut them in half lengthways and right through the centre of crown, leaving about an equal number of eyes on each side.

With larger-sized potatoes the first cut should be made across its length and about one-third from the end opposite the crown; this "stem"

end forms a set; whilst the other section is cut through the centre of crown at right angles to the first cut, making three sets in all.

Extra large potatoes should be cut evenly into four pieces with a regular cut lengthways as before noted, and then crossways or else into pieces containing from two to three eyes and weighing about 2½ oz. each. A thin knife is preferable, and should pass more freely through a seed potato than a crisp table one.

Time to Cut.—This should be done a day previous to planting to allow the raw surface to heal up; a sprinkling of wood ashes or slaked lime is advisable.

Sprouting Seed.—Mention has been made previously as to the difficulty of maintaining supplies of seed for the two plantings—July-August and in February—obtainable during the twelve months in this State, necessitating an importation for one planting, as the time between the harvesting of one crop and the planting of the next is so short. Changes of seed from a cooler climate are thus assured, as, if otherwise and an attempt was made to carry on with an early maturing variety, its vitality is soon irredeemably impaired. It is possible to make use of a quick-maturing variety to provide seed for a succeeding planting, provided it is put in early and harvested as soon as "ripe," and then shortly afterwards spreading out the potatoes in a shed or barn in shallow layers to dry thoroughly. Exposure to strong light will turn the colour of skins to a greenish hue, and the process will assist in prolonging their keeping qualities even when planted again.

If bagged subsequently, they will sprout much earlier than if kept in a large heap in a shed, which, if moist, will have a tendency to cause decay in the potatoes, and when they do sprout the shoots will be nothing like as robust as the treated seed.

Stored potatoes require to be frequently turned and picked over to take out decaying tubers.

Amount of Seed per Acre.—This will vary and depend on the class and size of sets. Usually 7 cwt. to the acre may be taken as an average.

Planting.—It is generally recognised that the earlier the spring crop can be put in, the better the chances of a heavy return, assuming, of course, that conditions are favourable. A late crop, or an unseasonable variety planted at this season, may strike humid weather and have a tendency to produce an over-abundance of haulms and a minimum amount of tubers.

For the autumn crop, the time is regulated by being put in sufficiently early to allow the tubers to grow and mature before the advent of frost. Whether the crop is to be planted on the flat or ridge will depend largely on the soil and environment. In dry localities, planting and subsequent working should be kept on the flat; the potatoes being planted every 15 in., and at a depth of approximately 4 in., immediately after the plough, and in every third or fourth furrow, according to the width being cut, so as to bring the rows from 32 to 36 in. apart, and allow for horse cultivation. When ploughed in, whether with disc or other type, it is preferable to plant on the side of the furrow

rather than the bottom, to prevent trampling of seed potatoes by horses. For ridge planting, the double mould-board hilling type of plough is to be preferred, but the single plough may be used; in any case the furrows should be planted up and filled in as quickly as possible after opening. Care should be taken in setting the hilling plough so that it will leave a hollow rather than a pointed crown. In the event of the use of fertilisers, reference should be made to the previous notes governing their application.

When opening furrows, undue exposure should be avoided and the planting and covering in arranged simultaneously; three good planters will keep one plough going. Machines may be used with advantage where large areas are planted; these are designed to complete the opening, the planting, and covering in at one operation.

After Cultivation.—The first cultivation should be given just after the young plants show up through the ground. Light lever harrows, with the tines set back from the perpendicular, are to be recommended.

A pair of light home-made harrows, useful for any class of work where "hills" are put up, can be made in a half-moon shape with short tines; these overcome the damage often associated with heavy and flat harrows which do not possess the adjustable tines.

Scuffling between the rows is most important, the ordinary Planet Junior type of machine being used, at least twice. The manner in which the ground has been worked will determine how the tines should be adjusted, so that the earth may be moulded in as desired towards the plants at each cultivation, taking care not to stir too closely or too deeply to disturb the roots.

Where hilling is practised, a special mould-board type of sweep can be attached to the machine for the purpose of combining the two operations at the time of the last stroke of the scuffler. The moulding over of friable soil is important in relation to protecting the tubers from the attack of the potao moth, also to prevent discoloration of potatoes which may be exposed to sunlight, and, if in cold districts where an autumn crop is obtainable, a protection of this character helps to save the potatoes from severe frost bite, if they have to remain any length of time before lifting.

Hilling up with the double-mould plough is advisable in damp positions, and in situations where this class of work is required; and it is equally as important to give the ridges plenty of body and not bring them to a point.

No further horse cultivation is required between the rows after earthing up.

Harvesting.—To anticipate a harvest is to take reasonable precautions other than careful cultural operations to get one, by paying attention to directions laid down, as preventive measures against blight, and the various troubles incidental to potato-growing.

When the crop is sufficiently ripe, this is generally ascertained by the dying down of the haulms, also by the condition of the skin of the potatoes, which should be fairly dry and set, and not readily peeled off.

Early frosts will often hasten the harvesting of the autumn crop, but in the case of the summer-ripening crop, growth is prolonged, and careful observation is necessary to determine how soon they can be lifted, as the hot weather and, at times, the potato moth make it expedient to harvest as soon as ready. Another reason is that some varieties have a predilection to a second growth.

The means adopted in the harvesting of the crop are many.

The flat-pronged digging fork is still in vogue, but where large fields have to be dealt with it is too slow and expensive, contract prices running from 1s. to 1s. 3d. a bag, and in some cases up to 1s. 6d.

An ordinary single-furrow plough acts fairly well, provided the ground is worked in lands, the side of the furrows on one side of the hill being trimmed off first before ploughing the potatoes out for the "pickers."

A double mould-board plough with a specially shaped pronged share is used largely in some localities, the potatoes being left on the surface after it.

If the ground becomes fouled with weeds or grass, the disc plough may be used, and it is in such situations that a potato-digger cannot operate to any advantage.

Potato-diggers are to be recommended when they can be used on friable soil free from rubbish. Many classes are on the market, some being designed for grading the crop; but, like most machines, they cannot accommodate themselves to all conditions.

Suitable weather and conditions are to be looked for when harvesting; the soil should be sufficiently dry so as not to stick to the tubers, and they should on no account be left lying exposed to the hot sun or to strong winds, which have a damaging effect on their keeping qualities.

Grading.—No grower can afford to neglect this most important feature. The vagaries of the market may at times shatter the good intentions of those who carefully class their products, but it is well known that the law of averages does not apply to a line of mixed-sized potatoes, and a depreciated price has to be accepted when the smaller and unmarketable stuff is included with that of better quality.

With a partly perishable product, there is usually little inducement to hold over for a rise, particularly with the summer crop when the wet season is at hand; and there is, moreover, always a fair and sometimes a heavy percentage of unmarketable potatoes after storing, as well as the extra cost entailed in picking over to be considered.

Potatoes of a regular and uniform size are preferred by the large consumer. The grower who can arrange his grading by a machine or with the "pickers up," in the field, does so to his own advantage.

Once in the barn, under cover, sorting-machines certainly facilitate this work; and, if a grower is specialising in seed potatoes, there is some justification in rehandling the "smalls," to cater for the "seed" trade with an even selection of the first grade, and brand up his marketable stuff with his own name or trade mark.

A recommendation has been made that when potatoes are stored they should be kept in thin layers, a dry airy place being preferred. There is little gained in neglecting to protect the open bags of potatoes in the field, as it is here that infestation may readily take place by the potato moth, owing to a practice (which is to be deprecated) of covering the open bags with a bundle of potato haulms.

The Varieties to Grow.—Several references have been made to the seasons and conditions governing the supply of seed potatoes to suit this State's varied requirements.

To recommend varieties—let them be early, medium, or late—is to conjure up the fact that our climatic conditions preclude the chance of a grower arranging a continuity in the production of one or more kinds where there are two distinct seasons in the year, unless fresh seed is brought in once a year from a cooler climate. The Stanthorpe district climate resembles more than any other that of New England, for instance, and it is quite possible to use seed from an early maturing crop planted there in October, harvest it in March, and hold over for the August planting in warmer localities instead of importing seed. But, although potatoes do remarkably well in some picked spots, the Stanthorpe district (from the nature of its soils) is unlikely to produce, for some time at least, anything approaching a percentage of the seed potatoes required in more favoured potato-growing localities. Varieties regarded as standard procurable types on the market as are follows:—

Early kinds—Early Rose, Early Vermont, Bliss Triumph.

Medium—Brownell's Beatuy, Satisfaction, Up to Date.

Late—Circular Heads, Guyra Blues.

Irrigation.—The potato is not a plant whose growth it is advisable to force. Should the land be dry at the planting season, and both the conditions and water be suitable for irrigation purposes, water may then be applied with advantage by well soaking the drills. After allowing a day or sufficient time to elapse, readily observed by noting the condition of the soil, planting may be proceeded with in the ordinary way.

A second watering, if necessary, may be given between the rows at a period when the young potatoes begin to form, but not later than this. After any form of irrigation, the breaking up of the crust or covering in, in the case of furrows, should be consistently adhered to.

POTATO TOPS AS FORAGE.

Last month it was stated in one of the Brisbane daily journals that a farmer lost two cows owing to their having eaten potato tops. From investigations carried out on the Continent of Europe it has been concluded that potato tops are equal in value both as regards chemical composition and digestibility to good meadow hay; if anything they are slightly superior to the latter in their proportion of digestible protein. The results of a feeding experiment with dairy cows confirmed this conclusion; the yield of milk and the proportion of fat and dry matter were at least as high as when good meadow hay was fed. If well harvested and made into hay or artificially dried the tops were found to be quite unobjectionable for feeding purposes from a hygienic point of view. When properly prepared they were also found to form good silage, which was willingly eaten.

To prevent any unnecessary disturbance of the tubers it is advised that the tops should be cut just before the potatoes are harvested in the normal course. Care should be taken not to include any roots, as the adhering soil may lead to disturbances in the health of the animals.

MARKET GARDENING.

HINTS ON SEED GROWING.

SOWING SEED IN DROUGHTY WEATHER.

Just as it is well to fill with water the holes into which we put seedlings, and to dip the roots of the seedlings into a thin mud of eleven parts loam and one part lime or soot (which protects to some extent from fungi and insects, as well as tending to keep the roots moist and active), so it is a wise proceeding to make thoroughly damp overnight any bed into which seed is to be sown, and to fill with water the drills into which we propose to put most seeds, and particularly such seeds as peas and beans.

The only seeds that do not seem to benefit from this treatment are those of the carrot. There is a well-established theory that carrots should be sown on dry soil. I have never heard a convincing argument as to the why and the wherefore of this; but experience suggests that there is a reason for the practice. At any rate, dry sowing appears to do just as well as wet sowing, however hot the weather.—*New Zealand Farmer.*

[Whatever may be the reason why carrot seed germinates when sown on dry ground, the fact remains that it does so in this State. If carrot seed is sown, and covered with some material, even sacks, for a week or so, the seed will germinate, whilst parsnips, lettuce, &c., will not succeed unless sown in moist ground.—ED. *Q.A.J.*]

Pastoral.

DENTITION IN SHEEP.

BY W. G. BROWN, Instructor in Sheep and Wool.

A most important matter in the keeping of sheep is the matter of judging the age of the animals. From the number of inquiries reaching this office concerning the subject, I conclude that a description of animals' mouths from birth to maturity will be useful to those whose knowledge of sheep is small.

In buying sheep, as in all other things which are bought and sold, the old Roman adage *Caveat emptor* applies, and a man who believes

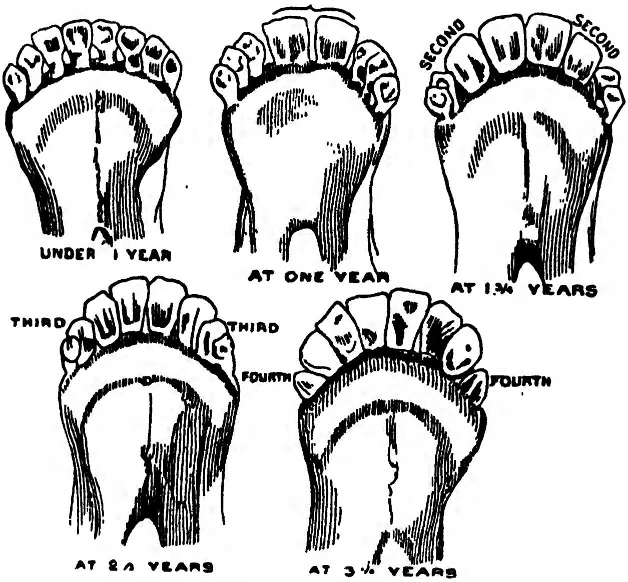

PLATE 3.

that he is buying young animals without knowing that they really are young or old, stands a very good chance of making a bad bargain. I know of two particularly hard cases to the buyers, neither of whom understood sheep, and consequently were saddled with unsuitable animals.

In the first case, the buyer thought that he was inspecting wethers of from two to three years old. He really bought sheep not less than six years old, and quite 20 per cent. "broken mouthed." In the second case, the sheep were supposed to be young wethers. This was literally

true, for they were certainly not more than five months old, and quite unsuited to the purpose for which they were bought—*i.e.*, fattening quickly for market. Wether lambs was their proper designation. An elementary knowledge of dentition would have saved the buyers from mistake on account of age at least.

I give in the accompanying plate (No. 3), taken from Professor Simonds' "On the Age of the Ox, Sheep, and Pig," an illustration of the incisors or cutting-teeth. In Plate No. 4 is shown the molars or grinders at various periods of the sheep's life up to maturity, which is, roughly, four years of age (Armitage's "Sheep Doctor"). At maturity a sheep has thirty-two teeth, eight incisors and twenty-four grinders.

At birth a lamb possesses two central temporary incisors, and at the end of four weeks all the temporary incisors (eight) are up, with three molars in each of the upper and lower jaws.

From the age of four weeks to the time of cutting the central permanent incisors, at from twelve to fifteen months, the only changes that occur are in the molars.

At three months the fourth molar (Fig. 1, Plate 4) is cut, and is a permanent tooth. Six months later another molar, the fifth, is to be seen (Fig. 2, Plate 4).

At eighteen months the sixth permanent molar is cut; the third temporary molar, like a shell, covers the top of the permanent tooth, while the first and second permanent molars have pushed off the temporary ones. Thus, a sheep has all its permanent molars at from eighteen months to two years old.

With the incisors, the first two, or central permanent teeth, make their appearance at from twelve months in early, and fifteen months in late, dentition. At from eighteen months to twenty-four months, the second pair of permanent incisors are up; at from twenty-seven months to thirty-three months, the third pair are in use; and from thirty-six months to forty-two months, the fourth and last pair of permanent incisors are shown, and the sheep is "full-mouthed" at about four years.

After this, it depends upon the class of country, and the early or late maturity of the breed, as to the wear of the teeth, whether the mouth is defective or otherwise. Only experienced sheepmasters can, even approximately, give the age of any particular animal. In the case of "broken-mouthed" sheep it is wise, if only three or four or fewer teeth are left, to pull them out and leave the animal "gummy." They cannot bite with odd or gapped teeth as well as they can with gums. But do not buy old sheep unless very, very cheap.

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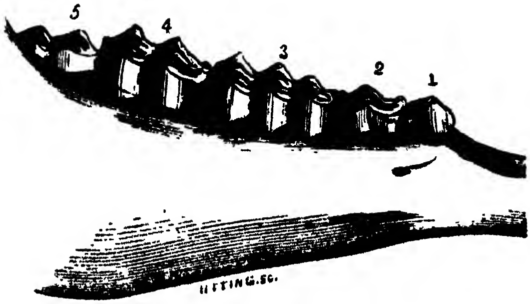

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Plate 4

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF DECEMBER, 1915.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Margaret	Ayrshire	14 Oct., 1915	822	4·2	40·58	
Sweet Meadows	Jersey	28 Sept. ,,	549	5·7	37·02	
Madam Melba	Holstein	28 Oct. ,,	856	3·5	36·10	
Miss Melba	,, ...	30 Sept. ,,	828	3·7	35·89	
Constancy ...	Ayrshire	24 Nov. ,,	767	3·9	35·10	
Twylish's Maid	Jersey	22 Oct. ,,	598	4·7	33·13	
Miss Jean ..	Ayrshire	5 Nov. ,,	778	3·7	32·72	
La Hurette Hope	Jersey	17 Nov. ,,	617	4·3	31·21	
Miss Edition	,, ...	27 Sept. ,,	616	4·3	31·16	
Rosebud II.	Ayrshire	11 Oct. ,,	661	3·9	30·24	
Gretchen ...	Holstein	16 Aug. ,,	776	3·3	29·90	
Bluebell ...	Jersey	20 June ,,	527	4·5	27·83	
Laurette II.	Ayrshire	9 Oct. ,,	653	3·6	27·53	
Daisy ...	Holstein	23 Nov. ,,	706	3·2	26·35	
Sylvia II. ...	Shorthorn ...	25 Aug. ,,	585	3·9	26·31	
Mischief ...	Ayrshire	27 Sept. ,,	606	3·5	25·56	
Lady Twylish	Jersey	5 June ,,	412	5·1	24·81	
Special Edition	,, ...	1 Nov. ,,	507	4·2	24·78	
Iron Plate ...	,, ...	21 Feb. ,,	372	5·6	24·63	
Miss Lark ...	Ayrshire	8 Sept. ,,	538	3·9	24·62	
Miss Bell ...	Jersey	2 July ,,	389	5·2	23·89	
Jeannie ...	Ayrshire	1 Nov. ,,	547	3·7	23·71	
Dottie ...	Shorthorn ...	27 Nov. ,,	477	4·2	23·53	
Nellie II. ...	,, ...	20 July 1914	535	3·7	23·19	
Violette's Peer's Girl	Jersey	8 Dec. 1915	436	4·5	23·10	
Silver Nell ...	Shorthorn.	16 Aug ,,	445	4·4	23·03	
Noble Dot ...	Jersey	2 May ,,	364	5·2	22·35	
Windyhill Davidina	Ayrshire	21 Aug. ,,	515	3·7	22·33	
Lady Melba	Holstein	17 Dec. ,,	517	3·5	21·17	
Simple Interest	Jersey	22 Oct. ,,	397	4·5	21·04	
Lady Dorset	Ayrshire	10 Aug. ,,	480	3·7	20·80	
Lucinda ...	,, ...	14 Oct. ,,	480	3·7	20·80	
Lilia ...	,, ...	19 Aug. ,,	521	3·4	20·70	
Rosine ...	,, ...	7 Aug. ,,	518	3·4	20·58	

In addition to the rough feed available in the paddocks, each cow received a daily ration composed of 12 lb. oaten chaff, 8 lb. lucerne chaff, and 4 lb. bran.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1915.

Six thousand three hundred and sixty-four eggs were laid during the month, an average of 120 per pen. S. Chapman's Brown Leghorns win the monthly prize with 141 eggs. The following are the individual records:—

Competitors.	Breed.	Dec.	Total.
C. E. Bertelsmeier, S.A.	White Leghorns	140	1,175
Mrs. Munro	Do.	127	1,146
J. D. Nicholson, N.S.W.	Do.	130	1,140
Jas. McKay	Do.	110	1,137
J. Gosley	Do.	129	1,135
A. H. Padman, S.A.	Do.	139	1,135
E. F. Dennis	Do.	133	1,121
J. R. Wilson	Do.	131	1,119
J. M. Manson	Black Orpingtons	126	1,118
A. W. Bailey	White Leghorns	124	1,116
J. M. Manson	Do.	136	1,096
Kelvin Poultry Farm	Do.	112	1,090
King and Watson, N.S.W.	Do.	115	1,081
Mrs. J. Jobling, N.S.W.	Black Orpingtons	101	1,081
O.K. Poultry Yards	White Leghorns	125	1,077
A. T. Coomber	Do.	129	1,073
E. A. Smith	Do.	125	1,064
S. E. Sharpe	Do.	98	1,063
W. Parker	Do.	138	1,061
C. T. Clark	Do.	121	1,056
C. Knoblauch	Do.	129	1,056
T. Fanning	Black Orpingtons	112	1,052
T. Fanning	White Leghorns	128	1,046
H. Hammill, N.S.W.	Do.	120	1,044
K. V. Bennett, S.A.	Do.	122	1,043
W. Purvis, S.A.	Do.	127	1,043
R. Burns	Black Orpingtons	124	1,030
Cowan Bros., N.S.W.	White Leghorns	129	1,027
F. Clayton, N.S.W.	Do.	121	1,025
E. Le Breton	Do.	105	1,018
Moritz Bros., S.A.	Do.	128	1,015
E. A. Smith	Black Orpingtons	131	1,011
W. Lindus, N.S.W.	White Leghorns	131	1,008
R. Burns	S. L. Wyandottes	117	991
Geo. Tomlinson	White Leghorns	114	990
W. Meneely	Black Orpingtons	111	988
R. Jobling, N.S.W.	White Leghorns	103	984
Derrylin Poultry Farm	Do.	101	982
Cowan Bros., N.S.W.	Black Orpingtons	113	972
J. G. Richter	White Leghorns	127	971
J. H. Gill, Victoria	Do.	128	970
W. Lyell	Do.	106	960
J. Zahl	Do. (No. 1)	108	953
Loloma Poultry Farm, N.S.W.	Rhode Island Reds	123	937

Competitors.	Breed.	Dec.	Total.
J. Aitcheson	White Leghorns ...	105	935
R. Jobling, N.S.W.	S. L. Wyandottes ...	97	931
G. H. Turner	White Leghorns ...	102	931
J. Zahl	Do. (No. 2)	117	915
E. Pocock	Do.	110	896
S. Chapman	Brown Leghorns ...	141	868
W. H. Forsyth, N.S.W.	White Leghorns ...	128	840
F. Clayton, N.S.W.	Rhode Island Reds ...	112	839
J. R. Johnstone	Plymouth Rocks ...	105	661
Totals	....	6,364	51,019

PURIFYING WATER.

A simple method of purifying almost any infected water needed for drinking, without boiling it, has been worked out by Dr. G. G. Naismith, Director of Health Laboratories of Toronto, Canada, and Dr. R. R. Graham, Assistant Chemist. The process is as follows:—Add a teaspoonful (not heaped up) of chloride of lime (costing about 6d. a ½-lb. bottle), containing about one-third available chlorine, to a cupful of water. Dissolve and add in any convenient receptacle three more cupfuls of water. Stir and allow to stand for a few seconds in order to let the particles settle. This stock solution, if kept in a tightly-stoppered bottle, may be used for five days. Add a teaspoonful to two gallons of the water to be purified, stir thoroughly in order that the weak chlorine solution will come into contact with all the bacteria, and allow to stand for ten minutes. This will effectively destroy all typhoid and colon bacilli or other dysentery-producing bacilli in the water. The water will be without taste or odour, and the trace of free chlorine added rapidly disappears.

From inquiries made in Brisbane, the editor of the "Australian Sugar Journal" says that the above can be thoroughly recommended, the only caution given by the Government Analyst's Department being against the tendency to use more of the chloride of lime than is prescribed, which may impart an undesirable taste. Use less rather than more.

Water containing mud in suspension is easily clarified by dropping hot wood ashes into it, or by the application of lime or alum. These two latter substances make the water hard. Chloride of iron may also be used. It is quite harmless, and a valuable constituent for all animals. Medical men prescribe iron in one of its severest forms as a tonic. One pound of chloride of iron (2d. per lb.) will clarify 1,000 to 2,500 gallons of muddy water, and much reduce the bacterial contents.

The Horse.

THE WAR AND THE OUTLOOK FOR LIVE STOCK.

The influence of the great European war on land and live stock has in a great measure confirmed the experiences of the past, for it has quickened demand and hardened prices, and incidentally at this time made some beneficial adjustments, where in the world-wide competition which British farming had to meet, prices had been unduly reduced, until the margin of profit had well-nigh disappeared. After a year of war it will be generally admitted that the trade for practically all classes of live stock has been much better than could have been anticipated. There has been a brisk and growing demand, and that at enhanced prices, yielding a fair margin of profit. A notable feature of the period has been the trade in purebred stock as mirrored in the public and private sales which have taken place. With the South American ports now reopened, the growing cry for fresh blood from U.S.A., and the great quantities of meat procured from abroad for war rations, which will entail a corresponding call for breeding stock for grading-up purposes, our British breeds will continue to be in great and increasing demand abroad and in the colonies; while it needs no spirit of prophecy to predict that the close of the war will see one of the greatest booms in purebred stock that has ever been experienced in this country. Breeders will therefore do well to so increase their stocks as to be ready to meet the call when it comes. There is every reason to believe that the trade for commercial stock will also be well maintained, and that at profitable rates. The new order respecting the slaughter of calves should also be helpful in increasing supplies. Meat and milk requirements are increasing, and the war has helped to equalise some of the growing disadvantages in the way of low prices, from which the producers have undeniably suffered. With so many men taken from the land by the war, including experts in breeding and feeding and many members of the veterinary profession, it is more than ever necessary that careful attention should be given to the health and well-being of stock, as it is only by maintaining animals in a thoroughly healthy condition that the best and most profitable results can be secured. This will be particularly necessary during the autumn and winter months, when climatic conditions, coupled with the necessary changes in rations, tend to produce ailments which a little foresight might have prevented. If disease is combated in its early stages it can more easily be dealt with, whereas, if neglected, the delay will certainly lead to further expense and trouble, and in many instances to the loss of valuable animals. The landed industry has already rendered magnificent service to the country in the large number of men it has contributed to His Majesty's forces. Those who must remain at home will render no less valuable aid by helping to maintain and increase the yield from the land and from our farm live stock.—"Live Stock Journal."

State Farms.

STATE FARM, BUNGEWORGORAI.

The manager reports for the month of January:—

Meteorological.—The only change in these conditions is an increase in temperature during the last week, the thermometer on one occasion reaching 108. The rainfall during the month ending the 12th was 87 points, making a total of 662 points for the twelve months.

Crops (summer).—As is to be expected, these are in a very unsatisfactory condition—that is, those which have not succumbed.

Vineyard.—The crop in this department has been harvested. Owing to the unfavourable conditions and the depredations of the birds, very little indeed was fit for marketing. For the most part, the vines themselves look well.

Orchard.—There is nothing fresh to report here, excepting that the trees look a little better than they did last month, a certain amount of relief having been obtained from the 87 points of rain.

Stock, considering all things, are looking well, but are a source of anxiety, more especially the horses, on this sandy country.

PASPALUM FOR ENSILAGE.

From the Director of the Queensland Government Intelligence and Tourist Bureau, Sydney, Mr. A. Meston, we have received the following extract from the Sydney "Daily Telegraph" of 20th December, on the utilisation of paspalum grass for the production of silage:—

"The manager of the Berry Experiment Farm, Mr. P. Quirk, in his annual report, remarks:—'The most outstanding feature of the farm is the object-lesson in converting paspalum into stack silage. There is no grass on the coast discussed more than paspalum, with divided opinions; many farmers are strong advocates of the grass, while others condemn it as worthless. This being a year (1914-15) of great grass growth, paspalum was plentiful, standing 4 ft. high, and we conserved it in the form of stack silage, about 250 tons, at a cost of 2s. 3d. per ton for extra labour. The silage is turning out well, and stock of all kinds are eating it readily. This is proving of great interest to the farmers, as it is the first year paspalum-silage has been attempted. Many of the farmers eagerly awaited results, as thousands of tons of silage might easily have been made at a nominal expediture.' "

The Orchard.

AUSTRALIAN CITRUS FRUIT IN CANADA.

"Fruit World," Victoria, publishes the following communication from Mr. B. J. Hansen, agent for the Victorian Government in Canada:—

"There arrived in Vancouver at the end of August, by the 'Makura,' a consignment of fruit from the Department of Agriculture, N.S.W., comprising 123 cases of lemons and 48 cases of oranges, sent as a trial shipment testing the market, and I am forwarding some particulars as to what favour the shipment met with on this side.

"My first man to interview was Mr. J. Cunningham, Inspector of Fruit Pests, who was very enthusiastic regarding the consignment. He immediately wanted to know why the Australian growers did not ship in large quantities, as supplies from California about this time of the year have always been very small. Mr. Cunningham says that the fruit can be brought into Vancouver during the months of August, September, October, November, and December, and compete well with any other fruit arriving from elsewhere.

"The oranges shipped were Valencia and Navels. The former arrived in splendid condition, the latter not so well, being a little dried, but all found a ready market, and sold on an average of 19s. 9d. per case. The lemons sold at 17s. 8d., but the market is not so good for lemons as oranges.

"I had the pleasure of being shown the whole shipment by the wholesale fruit merchant who was disposing of same for the broker. He also informed me that oranges, in particular, will always have a ready market in the last five months of the year, and any that can be shipped to arrive here for the Christmas trade will be sure of selling at a very good figure. The fruit, if anything, arrived in a badly graded condition for this market. The buyers want fruit packed in sizes of 96, 112, 126, 150, 176, 200, 250.

"The fruit was shipped partly in cold storage and partly as ordinary cargo. The former arrived in the better condition by far.

"I shall be glad of the opportunity of sending information to any of the Victorian fruitgrowers concerning this market, at any time they choose to write me."

PINEAPPLE CULTURE.

BEERWAH AND GLASS HOUSE MOUNTAINS.

Glass House Mountains has long been known as a citrus centre, though only a few orangeries have been established. The same may also be said of Beerwah, but during the past few years new settlers have happened along, and the area under citrus fruits has been added to. Some four or five years ago Mr. Frank Gowen and his sons laid out three areas for pineapples, and these have made good headway and given good returns. Messrs. C. R. Wilson, T. McWilliam, W. H. Lister, —. Peate, G. Markwell, and Herring and Simpson followed, and to-day there are about 80 acres of pineapples around the Glass House Mountains, and some forty near Beerwah.

The soil on the ridges is of a volcanic nature and is splendidly adapted for pines, because of the gradual slopes, and its nature is such that it is easily worked and kept clean. Truly, like most soils, fertilising has to be undertaken after a few years in order to replenish the soil, but, as in all other cases where this plan is adopted, it pays.

We have been favoured at various times during the past few years with a few of the pineapples from this district, and they are of good size and shape and most assuredly of excellent flavour, whilst we may mention that the oranges we have had from Glass House Mountains are as fine a sample as we have ever had the pleasure of tasting.

The district has some beautiful mountain scenery, and in years to come (when the fifty or more farmers now clearing and establishing citrus orchards and pineapple plantations add to the scenic beauty) it will be an attraction for city folk to spend week-ends and holidays.

THE MacGREGOR PINEAPPLE.

We have received from Mr. E. Smallman, Campsie Fruit Farm, Ormiston, the accompanying photograph of that portion of his orchard which is devoted to the cultivation of a special variety of pineapple which he obtained ten or eleven years ago from what was known as Skyring's Farm, Bulimba. The plants are most prolific bearers, as will be seen by the illustration, which shows them in full bearing just before Christmas. These were only planted in September, 1914, and a single quarter acre yielded 2,500 pines, averaging about 4½ lb. each in weight. One of the special good qualities of the fruit is that it keeps well, and never develops "black heart." A case of the fruit was sent to Sir William MacGregor, late Governor of Queensland, twelve months ago, and he expressed his unqualified opinion of the pines, as the finest in flavour and texture that had come under his notice when in Queensland. Mr. Smallman brought two very fine specimens to this office, each of which went over 4½ lb. and not picked samples. They were quite ripe, but very firm in the flesh, and their flavour quite deserved all that Sir William MacGregor said of them. There having been only one plant originally obtained, it took several years planting of "nibs" and tops before the present area was fully planted and bearing.

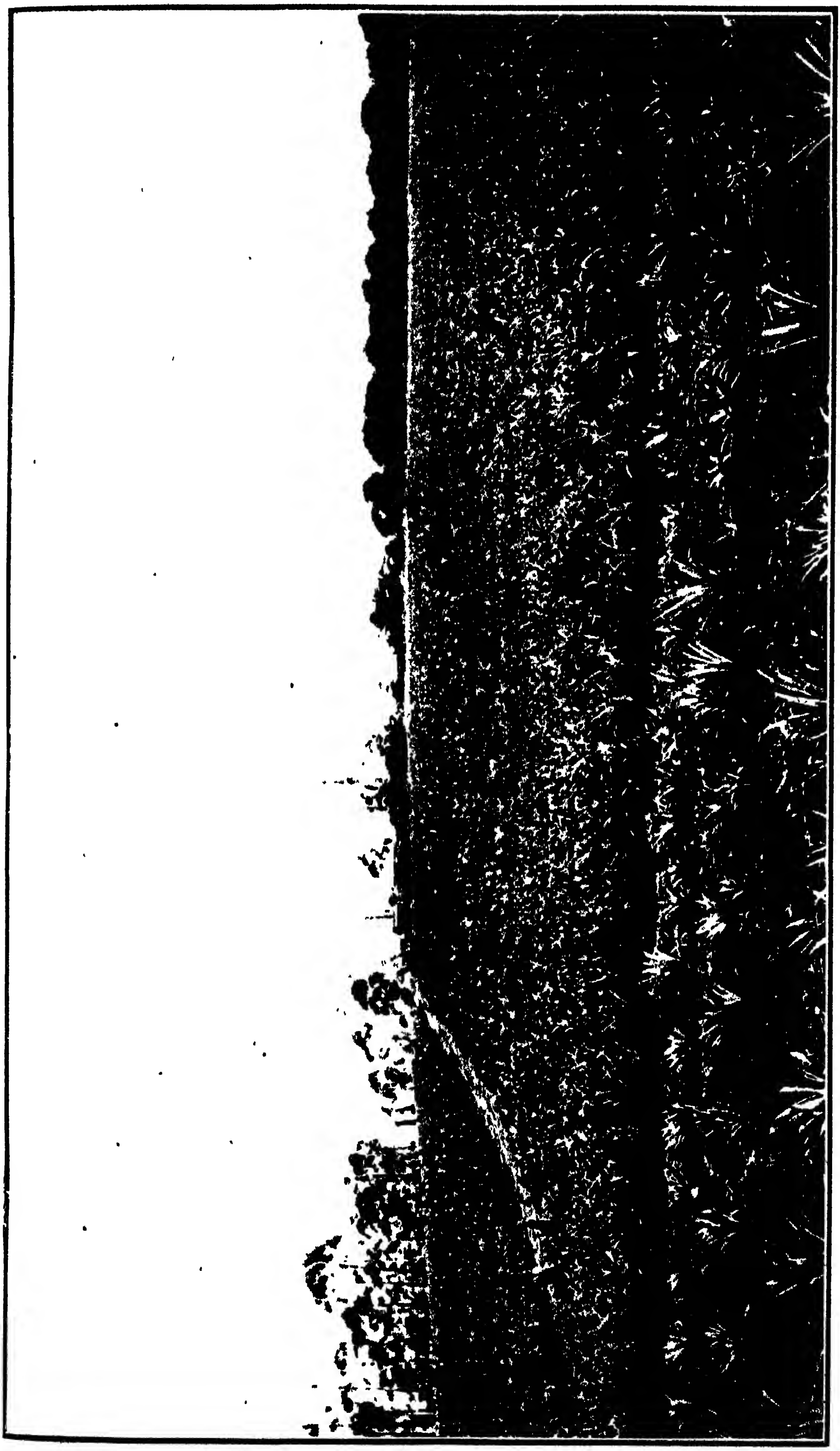
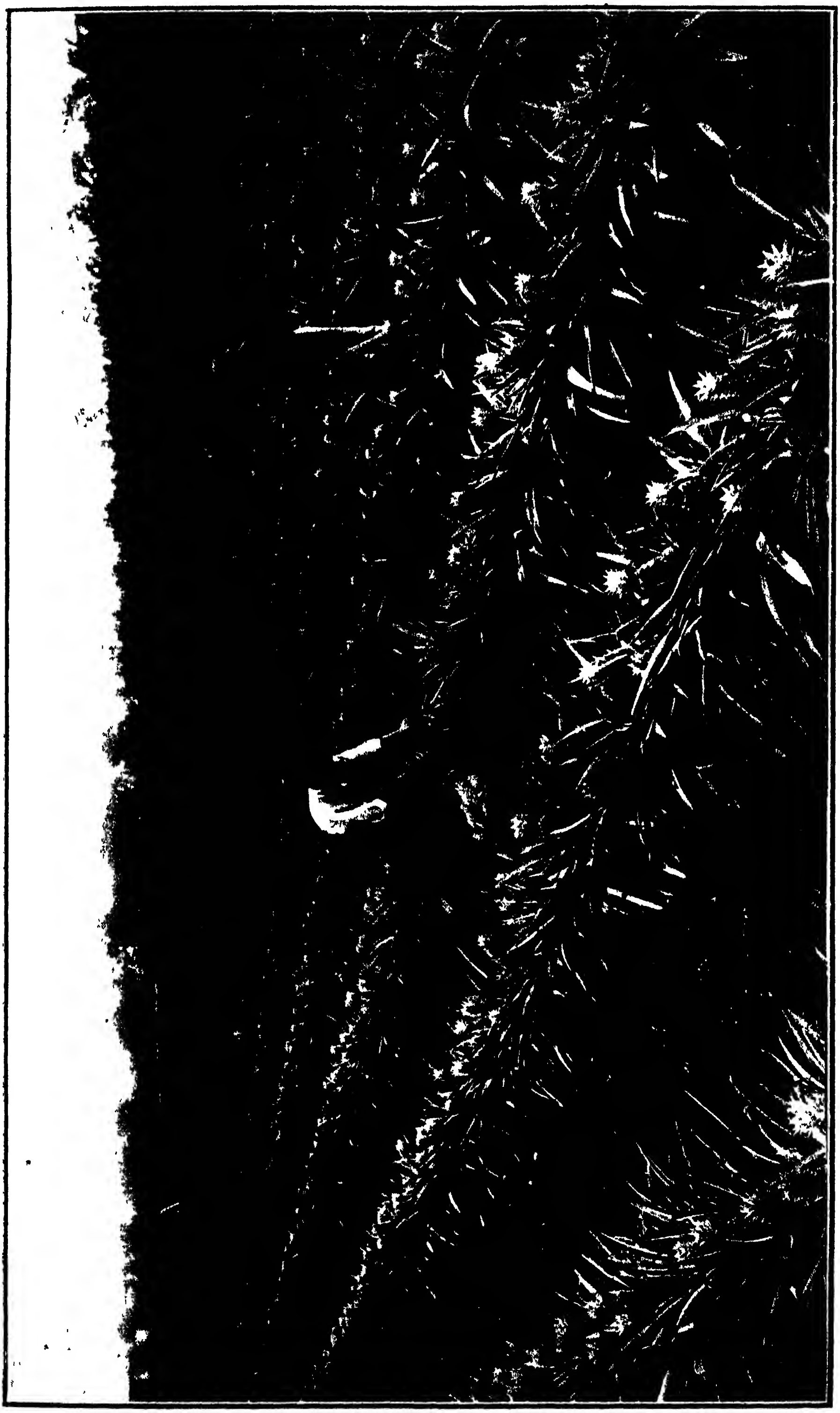


PLATE 5.—MCWILLIAMS' PINEAPPLE PLANTATION, "BEANDEM," BEERWAH.

PLATE 6.—LISTER'S PINEAPPLE PLANTATION, "COONOWRIN" (CROOK NECK), GLASS HOUSE MOUNTAINS.



Horticulture.

JADOO FIBRE.—No. 1.

The English papers are publishing a description of a process by which the vitality of plants has been enormously increased. The following description of what has been accomplished in this direction brings to our recollection a series of articles which appeared in this Journal so far back as 1898 and up to 1909 on a remarkable discovery made by Colonel Halford Thompson, F.R.H.S., Eastcliffe, Teignmouth, England, resulting in the invention of Jadoo fibre. Mr. W. R. Virgoe, Brighton, Victoria, was, in 1899, appointed sole agent for this substance for Australasia. In view of the revival of what appears to us to be the material then known as Jadoo fibre, now said to have been discovered by Professor R. Bottomley, we shall reprint all the articles on this discovery which we have published since 1898, but first we will record what the latest London papers say about it:—

"In a wooden box filled with moss, on the roof of King's College, in the Strand, potatoes are in full growth in October.

"Some weeks previously a box, 16 in. long, 6 in. wide, and 4 in. deep, was filled with moss and planted with four potatoes. Once every week the moss was watered with an extract from the bacterised peat, the discovery of which Professor W. B. Bottomley recently described to the British Association. The box, after eight weeks' growth, was as full as it could be of fine new potatoes. Given a little sun, there is no reason, he says, why these vegetables should not be grown in a similar way, not only on the roof, but in one's room, if necessary, almost all the year round.

"In many cases the size of plants has been doubled and trebled by this treatment. Radishes and tomatoes have even been grown in pure sand watered with the peat extract. Seventy-two cucumbers, weighing a pound each, have been cut from eighteen treated plants after a twenty days' growth, and sold at Covent Garden before those grown in the ordinary way were ready to cut. Sixteen pounds of tomatoes have been taken from one tomato plant. Similar examples of extraordinary growth could be multiplied by the score.

"Some time ago Professor Bottomley began these experiments in promoting plant growth by inoculating the soil with the culture of bacteria obtained from the root nodules of leguminous plants. It was found that in soil so treated more nodules were produced in the roots, and that the nitrogenous material in the earth was greatly increased. If the cultures contained humus—that is to say, the black, decaying matter that is found in the soil, they did better still.

" 'What we then wanted,' Professor Bottomley said, 'was a source of soluble humus, and we discovered it in peat. We found that by treating peat with special bacteria it was rendered soluble and formed an excellent medium for the growth of nitrogen-fixation organisms.'

" An important question is whether the discovery can be used for greatly increasing our home-grown food supply. We have seen what it does for vegetables. Will it do as much for wheat?

" 'There is no reason why it should not,' was Professor Bottomley's reply to this question, 'if the discovery is taken up and organised on a sufficiently large and authoritative basis. With a definite agricultural policy on the part of the Government, for example, home-grown crops would reap an enormous benefit.

" 'The whole point is this,' he explained. 'There are thousands of acres of poor land which could produce plentifully if provided with plant food, and there are, in Yorkshire, in Somersetshire, in Devonshire, and in Ireland, thousands of acres of peat now practically useless, which by bacterial treatment could be converted into a rich manure, capable, as experiments have shown, at least of doubling the productiveness of the soil.

" Incidentally, it would give Ireland a new industry, for with its practically inexhaustible supplies of peat that country could provide all that would be required for the whole of the rest of the United Kingdom. I am told of one bog alone of 800 acres, where the annual charge is only £20, from which as much peat as one wanted could be obtained.

" Besides the value of peat that has been shown by these experiments there is the fact that ordinary stable manure has been trebled in price in the last two years, and that it is difficult to obtain.

" The Government, it is interesting to add, are apparently alive to the importance of the discovery, for they have made a grant to King's College for the purpose of further investigation. Time, however, will be lost if the years are allowed to pass in experiment. The present is the moment for definite action."

The first account we received about Jadoo fibre was in October, 1898, when, under this singular name, a new and wonderful plant food was introduced in 1896 by Mr. W. R. Virgoe, proprietor of the Old Chatsworth Nursery, at Brighton, near Melbourne. To judge by the encomiums passed on the article by many leading horticulturists and fruitgrowers in the colonies, in England, and in America, it would appear that Jadoo, both in the form of fibre and as a liquid fertiliser, is worthy of attention. Neither of these can be called a manure. They do not "force" anything, but induce a wonderful growth of "fibrous roots," which enable the plant to absorb so much more nourishment that it grows quicker and stronger, and healthier in every way, than it can possibly do in soil alone. The fibre is imported in bales containing six bushels each, hydraulically compressed into a space of 5 cubic feet. For use, the fibre must be thoroughly disintegrated by rubbing it on a washboard or between the hands. When required for open ground for trees, plants,

vines, &c., or for potting plants, it should be moistened with water until a bushel weighs about 35 lb. For potting plants, pots should be used two sizes smaller than is required for soil, and then proceed exactly as with soil, but pot more firmly in all cases. If Jadoo and soil are used together, then a pot one size smaller may be used. It must then be thoroughly watered.

When sowing seeds, rough portions of Jadoo are placed over the usual crocks, and the pot is then filled up with fibre pressed firmly and thoroughly watered. The seed is then sown thinly and covered to about its own depth with a little silver sand. After-watering must not be overdone. When Jadoo and soil are used together, they must be thoroughly mixed. To apply the fibre to old vines, the earth is scraped away as near the principal roots as possible, and the Jadoo is placed about 6 in. below the surface and covered with earth. The object of this is to cause fresh roots to form *in* the Jadoo. It is most important that the fibre be moist. In planting out young vines, a gallon of Jadoo fibre is used both above and below the roots. Jadoo liquid, diluted 20 to 1, helps on the crop greatly, if given when vines are first "breaking" and when the fruit begins to colour.

If Jadoo is placed in the furrow in which vegetable seeds are sown, it is claimed that the crop will come to maturity at least a fortnight sooner than usual.

Potatoes are early matured by placing them in 2 in. of fibre.

In the "Gardener's Chronicle" it is stated that some potatoes were grown in Colonel Halford Thompson's garden at Eastcliffe, Teignmouth, England, which had been grown in Jadoo fibre. The sets were planted over a thin layer of Jadoo, and about 2 or 3 in. over and around them. They were then covered with earth in the usual manner. The crop yielded 5 lb. 2 oz. per plant, being in the proportion of 22 tons to 25 tons per acre of marketable tubers.

Jadoo can be used many times over; in fact, it has not yet been ascertained when it becomes exhausted. This is a great point in its favour, and tends materially to reduce its original cost. When taken from a pot, all that is necessary is to spread out the fibre in a box and expose it to the air for a few days to sweeten it; then water it with liquid Jadoo at a strength of 1 to 20 of water until sufficient moisture has been absorbed to restore it to its original weight (about 35 lb. per bushel). It may then be used as at first.

What Jadoo really is, we know no more than the reader. We merely make mention of it, as we do of many new ideas, in the hope that some enterprising person will make experiments for the benefit of others.

In February, 1899, we received a letter from Mr. Virgoe, in which he gave the following account of the ingredients entering into the composition of Jadoo. He wrote:—

"In your article on Jadoo, you say 'you do not know what Jadoo really is.' I did not until this last month, but I am now in possession

of the detail of the process of manufacture, which I now give for your information, omitting the exact proportions of the ingredients, which, however, I am willing to also furnish, if desired. Jadoo (pronounced Jah-doo) is, I understand, an Indian word, meaning ' magic.'

" Now, as to its *not being a manure*, owing to my assertion to that effect, I have great difficulties with the Customs in South Australia and Western Australia, as on that ground they have imposed a 15s. duty, which I am trying hard to get removed, and, as you will see by the particulars herein, I think it must be deemed a manure. At any rate, I shall for the future call it a fertiliser.

" The foundation of the Jadoo fibre is absorbent peat moss, a small sample of which I send you under separate cover.

" In a large boiler partly filled with water the following ingredients are put in various proportions:—

" Soot, pink gypsum, bone meal, phosphoric acid, potash, nitrate of soda, sugar.

" The boiler is then filled up with the peat moss in a dry state, and the whole is kept at boiling-point for thirty minutes.

" The mass is then taken out and stacked. To it is added yeast, and the mass is fermented, and kept in that state, and at a certain temperature for a month or five weeks, when it is fit for use.

" The Jadoo liquid is made in the same way, but without the use of the peat moss.

" The Jadoo Company admit that Jadoo is still only in its infancy, and that scientific research may vastly improve it."

The accompanying illustration is from a photograph taken on a tobacco plantation in the United States, on which Jadoo was used as a soil and fertilising medium. We are indebted to Mr. Reg. E. Finlay, London, late manager of the Queensland Investment Company, for the photograph.

Following is the substance of a lecture delivered before the Vine and Fruitgrowers' Association of Worthing, England, by the inventor of the above fertilising agent, Colonel Halford Thompson, F.R.H.S.:—

" Take the case of a greenhouse. As a rule, the way in which pests of any kind find their way into a greenhouse is by getting into the soil. Now, Jadoo has been kept at the boiling point for thirty minutes, and upon that depends much of its success, for whatever living organisms may have been in the material must, in this way, be destroyed. Jadoo will have no effect at all on the tap-root, but an enormous effect on the fibrous roots near the surface. Look at this (exhibiting a picture of a *Tacsonia*). That shows you something of its effect on the fibrous roots. It is a photograph of a *Tacsonia* that I had in a large stone bed in a conservatory. It was flowering very badly. I took off the top 3 in. of earth, laid bare the roots, put a layer of Jadoo round them, and covered it with a board. In less than six weeks, that Jadoo was simply a mass

PLATE 8.—TOBACCO-GROWN WITH JADOO.

of fibrous roots; the whole 3 in. were full of roots, and the plant flowered grandly. In the case of fruit trees, I have found that Jadoo enormously increases the crop of fruit. One of the greatest advantages is, that Jadoo prevents flagging. When you plant out a tree, put a small quantity of Jadoo above and below—above only, if economy has to be considered—and that tree will never flag. You are certain then that you will not lose it. We have had lately some very strong certificates from the Government Forest Department at a place in Denmark, and they say that they have attained extraordinary results by planting out in this way, and also by sowing in the Jadoo mixed with earth. The Agricultural Society of India recently sent some certificates showing the difference that Jadoo makes in the time that seed takes to germinate. In the case of tea, it was eleven days for Jadoo against thirty-seven for earth; in the case of coffee, it was rooted in one-half the time it took in earth. Every kind of thing they put into Jadoo always rooted in at least half of the usual time. And that brings me back to the old point—*Jadoo encourages fibrous rooting*. That is what you want. If you are using Jadoo, you are attracting out surface roots. You have the whole thing under your hand, and you are putting in something of which you certainly do not lose the effects in any reasonable period. You are improving the soil; the peat moss of which the Jadoo is largely composed remains, and is almost imperishable, so that whenever you give food afterwards, you have a medium there that will store it and convey it to the plant."

The "Fruitgrowers' Newspaper," London, referring to the use of Jadoo fibre, wrote at the time as follows on

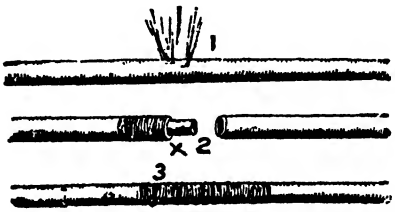
FORCED PEACHES.

"Of the many tests made during the past year none is more instructive or important than our experiments with peaches under glass. This fruit, provided it is handled in a proper manner, can be made exceedingly profitable, and the result we secured passed all expectations. We found that our hint to ensure a cool root, or the roots resting in cool surroundings, was a good one. . . . Now, the great thing was to ensure these cool root conditions to best advantage, and this we found could readily be done by the aid of Jadoo fibre, which we had already used with such good results on our pot tomato crop. We emphasise this point. . . . As these tests as regards forced peaches have been made in our experimental house on growing crops, of which a strict daily account has been kept, they are reliable, and of the utmost value to fruitgrowers. In potting the trees the roots rested in a mass of Jadoo fibre, care being taken that it was all covered well with soil to prevent drying out. It is useless to put Jadoo on the top of the pot on that account, and if this point is observed then its effect will be exceedingly beneficial. A good soil was used, the roots were well firmed in the earth, and the drainage conditions were all that could be desired. A water-logged soil or a moisture-laden atmosphere without a free circulation of warm air is injurious to the peach, and must be avoided. As the Jadoo fibre keeps the roots in cool condition, water must not be supplied too freely, this

being regulated by the actual wants of the trees, which are easily observable. We used good turfy loam and a sprinkling of sand. A good thing to ensure at starting is a low temperature; the more gradual the start is made the better, 40 degrees F. being ample. Then great care is needed not to have too high a temperature when the fruit buds show—in fact, not until the fruit sets—as too high a temperature will result in the loss of fruit. If a temperature of first 40 degrees at night, increasing to 50 degrees after the fruit is well set, and after the stoning period of 55 or 60 degrees by night, and 70 to 80 degrees by sun heat, is ensured, things will be satisfactory. Then, after the fruits are half-grown, a higher temperature accompanied by free supplies of moisture and foliage syringing will bring the crop on in good condition. When the fruit is colouring ample supplies of sun heat are needful, and plenty of light and air also tend to the production of perfect fruit. . . . There can be no doubt that the heavy crop and the fine quality and colour of the fruit was due to the cool condition of the roots, ensured by the free use of Jadoo fibre; consequently, this test proves the great value of this material in peach culture, either under glass or in the open air."

MENDING A LEAKY HOSE.

Not many people, especially amateur gardeners, understand how to repair a leaky hose. Often, finding that binding the leaky spot with various materials has no effect, they discard the old hose and buy a new one. The *New Zealand Farmer* (January, 1916) shows how a hose, leaking in many places, can be repaired in a very simple manner. "Nothing" (says that journal) "is so disagreeable in the garden as having to use a hose that is discharging water at about a dozen places at once. Now, our illustration shows how a leak can be mended satisfac-



MENDING A LEAKY HOSE

torily, or two pieces of hose joined together. Fig. 1 represents a piece of leaky hose. Fig. 2 is the same cut asunder and a piece of bamboo or metal pipe (diameter according to the inside measurement of the hose) inserted in one end and tied. Old brass picture rods or curtain poles, or the light iron piping that is used for carrying electric wires in a house, all make good material for this job; the only point is that it must fit inside the hose. Fig. 3 shows the other end slipped on and securely tied. If this work is done well the hose will be as good as new, and can be made to last for several seasons longer than it otherwise would."

Forestry.

FELLING TREES.

So many regrettable accidents have lately occurred, resulting in some cases in the loss of valuable lives of those engaged in scrub felling and timber-getting, that a few suggestions, as follow, by one who has been engaged in both occupations may be considered worthy of noting.

Felling a tree scientifically is an art gained by long practice. We are dealing now with saw work. The first thing to be done is to ring the tree, removing a ring of bark about 6 in. wide all round, exposing the sap wood. The saw is then entered on the leaning side. If the tree be absolutely perpendicular, a survey of the branches above will clearly indicate to which side the tree will incline when falling. It will naturally fall on the side of the heaviest limbs. In such a case the cut is begun on that side. To ensure a perfectly horizontal cut, the saw must be held horizontally, care being taken to keep the back up, as it tends to sag downwards, until it has entered far enough to rest on the lower side of the cut. But still the back must be kept up, for, if cutting proceeds with the back resting, the cut will naturally take an upward direction.

Having entered the saw to a depth not further than nor even quite so far as the centre of the tree, withdraw the saw. Here I may remark that when a tree has a considerable lean, the saw should be withdrawn as soon as it is in the least pinched by the coming together of the two parts of the cut. Cases have occurred in which the saw has moved fairly freely, and yet could not be withdrawn owing to the cut having closed behind it. In such a case nothing remains to be done but to chop the saw out, unless it has a removable eye, and then, of course, it can be withdrawn through the cut, so long as it has motion at all. Having now entered the saw as deeply as the hang of the tree will allow, or, in the case of a perpendicular tree, almost to the centre (although to one-third of the diameter is preferable), the sawyers go to the opposite side of the tree and again enter the saw. Now it is that great care and nicety are required. If the new cut is begun too low, either there will be a great labour in wedging the tree off at the last, or it may fall towards the lower cut, and loss of life may ensue. If the cut be too high, over half the first log will be some inches longer than the remainder, and as a consequence the rails, posts, or whatever is to be split from it will be of unequal length and form a "job lot," entailing extra work on the fencer.

I have known men to hit the first (or belly cut) so exactly with the back cut that, except for the unavoidable splintering of the last fibres of wood holding the tree up, none could have told that the two were not a single cut. I had a mate who always drew a charcoal line round the butt of the tree, and worked to that line so truly that we rarely had a difference in the stuff split from the butt log.

Now come some of the niceties of felling, which are adopted to ensure the safety of the timber-getter and also the soundness of the log. Many a tree has split up before being two-thirds cut through by badly managing the final cutting, especially in a high wind. But I would not advise anyone to attempt to fell heavy timber during a gale of wind. I have tried it on two or three occasions, and always with loss.

The usual result is what is technically known as a "kick up."

This is caused in the following manner:—The tree is a slightly leaning one; a heavy breeze is blowing; a deep belly cut has been put in. The back cut has got well in, and the tree is a free running one. Each pull of the saw weakens the remaining wood. Suddenly a gust of wind seizes the top of the tree, which leans over and splits from the depth of the back cut to a length of perhaps 15 ft. Then one of two things happens. Either the back half of the tree, breaking off from the lower half, makes a wild flight into the air and comes down suddenly with terrific force, some distance to the right or left of the stump, or else it does not break right away, but remains suspended. In either case the tree is useless to the splitter. I shall presently show the great danger which exists in this and other cases to human life. Meanwhile I will proceed to fell the tree which has been waiting for us. Having got the saw in to a little over its own depth (in a tree 3 ft. in diameter, say) in the back cut, if you hear no cracking sound you may go on sawing till you reach a depth of 15 or 16 in. Now, without withdrawing the saw, move round to one side gradually, continuing to cut as you go. This is cutting out the "quarters." You do this on both sides till your quarter cuts join the belly cut. The quarters must be deeply cut in, as it is this work which prevents the tree, if a free one, from kicking up and splitting. Now you go back to the back cut, and as there is now plenty of room behind the saw you insert one or more wedges.

Although the time to decide where a tree shall fall is before commencing to cut (the belly cut always being put in on the falling side), yet the needful direction can be given by the judicious use of wedges. Another great help is to cut a notch out of the stump, leaving the butt projecting about 3 in.

This notch serves a double purpose. It leads the tree in the direction in which it is to fall, and it quite prevents the tree from slipping back on the stump (as often occurs), and rushing backwards over it for many feet like a battering-ram. I have known men killed by a tree doing this, and I saw a most miraculous escape of a mate of mine when we were felling an enormous ironbark at the Pimpama, at Ormeau. This tree was nearly 6 ft. in diameter, and rose perfectly perpendicular to a height of about 50 ft. to the first branch. We cut this tree completely through, so that it actually spun on the wedges, which would take no effect on it. We, of course, stood at the stump waiting till it should begin to fall, when we would step back quietly. Suddenly the tree, probably acted upon by a light puff of air up aloft, turned slightly and began to fall in the direction in which we were standing. It then slipped over the stump. My mate, instead of standing his ground coolly, became panic-stricken,

and ran right in the track the huge tree was shooting along, supported on the stump. Just as the butt reached him he fell, and I saw that enormous tree rear up 20 ft. in the air and come down with a crash within a foot or so of the fallen man. At Indooroopilly a man was jammed 3 ft. into the earth by a big tree acting in like manner. It not only killed, but actually dug his grave and buried him.

However, we shall never get our tree down at this rate. We have made the belly cut, the back and quarter cuts; we have notched our stump, and now you may put your wedges in. If you wish the tree to fall towards the right a little, hammer up your left-hand wedge with the maul, and keep on pounding until the maul rebounds with a dull thud. That is a sign that the wedge will go no further till the wood is further cut. Now go to work with the saw again. Cut well in at the quarters; then cut out the back wood. Keep hammering up your wedges. Now when you hear the tree begin to crack, you must keep your nerve and stick to the saw. Saw as hard and as quickly as you can, so as to cut the last inch, if possible, before the final separation takes place. As the tree gracefully bows its head for the crash, *on no account run away*. Stand fast, even with your hand on the falling giant, till you are quite sure that it is going clear on to the spot you decided on. *Then* step well clear, for a tree on striking the ground often rears up its butt like a dying whale its tail, and brings it down with a flop, perhaps 6 ft. to either side, but you have, meanwhile, quickly got 6 ft. away from danger. Running away is the most dangerous thing a man can do when felling a tree with the saw. When felling with an axe there is no need to run, for the tree in falling jumps forward clear of the stump and never "goes back on you."

When timber-getting in a scrub, the timber-getter runs the gauntlet of several dangers. First, the head of the chosen tree is often out of sight. Next, it is usually bound to hundreds of other trees by stout lianas or vines; vegetable ropes that hold it up, even when cut through, and cause it to defy any attempts at directing its fall. Then the sawyer is surrounded and hampered by thick-growing brushwood and young saplings, interspersed with "lawyer" and other troublesome vines. Perhaps, at the foot of the tree, where the foot would rest in working the saw, there is a large jumper ants' nest, and not unfrequently a fine snake comes crawling along to see how matters stand. So that the sawyer has to look into the air, on to the ground, and watch his work at the same time. The first thing to do here is, of course, to provide an avenue of escape, by clearing away vines and undergrowth, if not all round, at least to the width of a clear track.

Should a gust of wind suddenly force the tree towards the back cut, the saw will inevitably be jammed. If the tree refuses to answer to wedges and gets a decidedly wrong lean, it is useless to try and release the saw. Wrenching at it will only result in "buckling" it. Besides, in such a case, the tree is liable to fall at any moment, and in any direction except the right one. The best thing to do is to let go the saw and await developments. The tree *may* go back if the breeze dies away. When this happens, ram in your wedges as quickly as possible, and go on sawing.

I once saw a marvellous escape from death, resulting from such an accident as I have described. My mate and I were timber-getting above the Seventeen-mile Rocks, on the Brisbane River, in 1863. We got the saw jammed by a gust of wind. He stuck to the saw whilst the tree was groaning and cracking. I called to him to let go. Instead of doing so, he actually got in front of the tree, and caught the saw on both sides protruding from the cut, to try and work it out. Suddenly the tree fell. He just had time to throw himself at full length alongside a dead log. I saw the big tree crashing down across the log, which looked old and rotten. If it were crushed, then I would have to pick up what was left of my mate and hold a private inquest. He sang out: "Good-bye, lad; I'm done." But he was anything but done. The log was solid. His first move on crawling out was towards his beloved saw. "There! I knew it would be buckled." Not a word about his wonderful escape, which seemed to him but an ordinary circumstance.

Now, one word about working the saw. Some inexperienced men, in fact all, think that by laying their weight into it they are doing good work. This is their mistake. The saw should run easily, no violent pressure being placed on it. Especially in felling a tree is it essential that each man should give to the other. If one man keeps digging the saw in, he drags the other after him. I have sometimes allowed a new chum to pull me round from the back to the belly cut, and he has wondered how it happened. It is the same when cross-cutting. The saw should run easily, working by its own weight. No undue pressure is required.

It is not a bad idea, when felling a tree, to lay a couple of small logs at about 10 ft. apart, and let the tree fall on them. This raises the butt from the ground and admits of easy cross-cutting without any more wedging than is necessary to keep the cut open to allow of the free running of the saw.

GUAVA VINEGAR.

In November last we were asked to give a recipe for making mango vinegar. We were not able to answer this question at the time, but we have now found a recipe given in the "Journal of the Jamaica Agricultural Society" for making guava vinegar. Possibly this might be applicable to mangoes. The fruit should be well ripened. Wash, and cut in halves, cover with plenty of water and simmer for two hours, strain through a colander, and then strain the juice through a bag. Bottle, and then tie muslin over the tops of the bottles. It requires about five months to turn into strong vinegar. In filling jars or bottles with juice which is to make vinegar, remember that it is well to leave space for plenty of air and only fill the receptacles about two-thirds.

Tropical Industries.

COTTON IN TEXAS, U.S.A.

Our readers, especially those interested in cotton-growing, will remember that in May, 1914, a gentleman from Texas, U.S.A., Mr. E. E. Wood, paid a visit to Queensland with the object of ascertaining the possibilities of growing cotton in this State. Mr. Wood visited several districts where cotton had been, and was at the time being, grown here. He was so much impressed with the excellence of the cotton grown on Queensland farms that he announced his intention to come over and bring with him several American cotton-growers, to settle in this country. He obtained samples of our Uplands cotton, which, he said, could not be surpassed as to quality and returns per acre in the best cotton-growing districts of the United States. In April, 1915, he contributed the following notes on the industry to this Journal:—

"Under separate cover I am sending you some papers that you may get a fair idea of conditions here." With these came a photograph of Mr. Wood's ginnery at Childress, Texas, in which were depicted an American cotton-grower and his five sons, all of whom, as well as Mr. Wood himself, would have come to settle in Queensland, had it not been for the outbreak of the European war, were it not that they were tied to property that then, as now, could not be changed for money or paper currency. Notwithstanding the then low price of cotton, the farmers in the cotton-growing States were in an easy condition, although the drop in the price of cotton in 1914 from 13 cents to 7 and 6½ cents (6½d. to 3½d. and 3¼d.) was a sore disappointment to the grower.

"For cotton ginners it was a very profitable season, also for pickers. My plant has ginned 1,450 bales to 18th December—eighty days' operation=18 bales a day.

"We have had bad weather since for ginning, the ground being covered with snow, and it looks like it will be March or April before the remainder (about 20 per cent.) of crop will be in.

"I believe I will be able to dispose of my gin property as it has shown to be a good money earner. My other property, land and city property (should I leave), would be unsold. War conditions have stopped investments in real estate, and money is available only for keeping business going. However, prospects are good (some say for boom) for better times ahead, but you know the majority of Americans are optimists.

"I started a cable to your Under Secretary for Agriculture in October, offering some good cotton seed cheap, but it was turned back at New York by the censor. Also it would have cost more money to take it through London. They only wanted 25 dollars! Cotton seed has more than doubled in price since, and it would now take from 1·25 (5s. 2d.) to 2·00 dollars (8s. 4d.) per bushel to get good seed. Gin-run seed about 40 cents (1s. 8d.) bushel. Queer these war lords can't read! By this time, I suppose, Australians have got over the shock and excitement of war and settled down to make a clean job of it.

"I enclose you letter received from chance acquaintance I made on train from 'Frisco home; he got the Australian fever from me. I wrote him back the war could not stop the world from going on, and that after it was over there would be millions of Europeans shifting to get

away from after-war burdens, which are likely to be more unbearable than war itself.

"Should the Queensland Government organise and promote immigration along the lines of some of the large land companies (adding the cost of the service to land sold), there could be a good business from America.

"Cotton lands, no better than Darling or Peak Downs, are selling in Texas at 75·00 dollars (£15) to 150·00 dollars (£30) per acre. And there are thousands of tenants looking for the opportunity your country offers, but are too timid or not able to make the move. I hear of some scattered Australian travellers who would be glad to get back home."

The letter referred to by Mr. Wood was received from a large stock breeder in the United States (Mo.) who became very much interested in the former gentleman's enthusiastic account of the splendid stock-raising capabilities of Queensland, who would probably have been here now but for the war, which he thinks "will ruin the possibilities of Australia for a good few years to come."

During his stay in Queensland, Mr. Wood informed himself on the subject of cotton-picking by hand, and was surprised to hear that pickers in Queensland rarely reached 200 lb. a day. He sent us the picking records in Texas, which show what can be done in this line by boys and girls in that State, where the cost of picking, as with us in Queensland, amounts to about ½d. per lb.

Reports, he said, of good picking by the boys are coming in right along. Dennis Sherrell, the eleven-year-old son of D. W. Sherrell, of Tell, picked 350 lb. of cotton in one day. Cotton is fine in every neighbourhood, and the ones who get up and go after it have no trouble in getting the big weighings.

Claudie Scarlet, a ten-year-old girl, picking cotton on J. H. Andrews's farm in Garden Valley, picked 506 lb. of cotton Monday. Miss Claudie weighs only 67 lb. This is a record hard to beat, and one the boys will have to work hard to overcome.

Here in the South our chief fear now is that the European savages will quit wearing clothes.

Pickers are paid one half-penny per pound. At this rate, a family of four pickers like Miss Scarlet could earn £4 6s. per day, whilst eleven-year-old Sherrell would add 14s. 7d. per day to the family income."

Yet, notwithstanding all the evidence we have of the adaptability of over two-thirds of Queensland to cotton-growing, we find that the farmers prefer to grow crops such as wheat, &c., which fail, as did the crop of 1915, during a drought, to planting a drought-resisting plant like cotton. Had the hundreds of acres under wheat in 1915, which did not return a bushel of grain per acre, been under cotton, they would have yielded from 1,000 to 2,000 lb. of cotton worth 2d. to 3d. per lb. in the seed, or 7½d. per lb. ginned. But it is, as is natural, hard to induce the established farmer to adopt a new system or a new crop. It was the same in the old sugar days. Farmers then could not realise what money there was in sugar-growing, even when raw sugar in the sixties and seventies, was selling at £70 per ton, and a sugar-mill could be erected for from £1,500 to £2,000.

There appears to be some move in the direction of cotton-growing in this State, and this is being fostered by the Department of Agriculture and Stock by supplying cotton seed gratis, and undertaking to take all

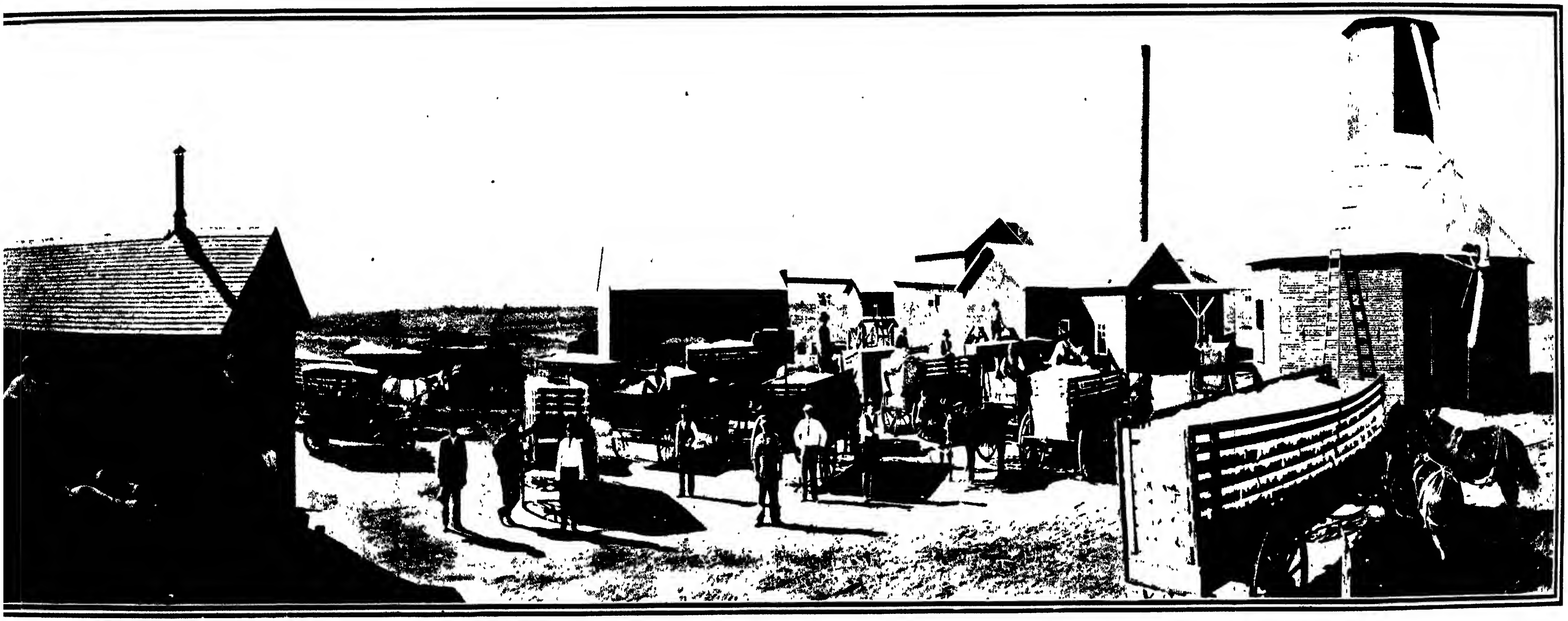


PLATE 9.—MR. E. E. WOOD'S COTTON GINNERY, CHILDRESS, TEXAS, U.S.A.

the cotton grown, paying the farmer a preliminary 1¾d. per lb., and, further, all profit over and above ginning, freight, &c., charges. after receipt of account sales from England. In December last we received the accompanying illustration of Mr. Wood's ginning establishment at Childress. We cannot give any particulars of this apparently extensive establishment, as no letter accompanied it.

In a late communication to the editor of this Journal, Mr. Wood wrote:—

"Conditions are very unsettled here (in the United States), people and business trying to fit new conditions brought on by the war. We have passed over the worst, and are now looking for largest good to come from the war. Wheat is high and cotton is 10 dollars (a little over £2) per bale above the low point, due to an open outlet for the staple. News from Australia is very scarce in this country, and I am curious to know how the war is affecting your country. I am interesting some oil men in oil and gas prospects in the Roma district, which prospect I, as a layman, consider equal to or better than a great many wild-cat propositions in this country, and for people that chances appeal to it would look good. In this country, when gas is found, there is sure to be oil in the neighbourhood in paying quantities. Oil in Australia would be equal to Mount Morgan for profit. Men in different lines of business are waking up to the fact that there is a country as large as U.S. in a virgin state and full of opportunities for men of the right stamp."

[The conditions under which prospecting for oil in Queensland may be undertaken have altered since Mr. Wood was in the Roma district.—Ed. "Q.A.J."]

In a letter from Mr. Wood, dated 10th December, we have the following information as to the position of the cotton industry in the United States. He states that it is still his intention to come to Queensland, when war conditions are favourable.

" From a ginner's point of view, this season has been a disappointment, as the crop is about half as large as last year. Cotton-seed has been very high, bringing $35.00 (£7) to $45.00 (£9) per ton. Lint cotton has been selling at 11 cents (5½d.) to 13 cents (6½d.) per lb. A 600-lb. bale has been giving the farmer a return of about $100 (£20) per bale, including seed.

" I am anxious to know what success your people have had since I was in your country, with cotton.

" My intentions are still what they were, but with the war on, I feel your country would handicap one who is looking to do something.

" However, I am getting business in shape to go when the favourable time comes.

" Last year, at this time, the cotton-grower was badly disappointed. This year it is the reverse, and I am looking forward to planting a full crop and expecting a fair price next season. With the activity of the boll weevil, and shortage of fertilisers in the eastern belt, it is not probable that a large crop will be raised. For this year the Government is out with an estimate of the total crop of the United States at 11,100,000 bales (besides linters*) of 500 lb. each."

* Linters are the short cotton left on the seed after ginning, and this is recovered by special machinery. Value, 3s. per cwt.—Ed. Q.A.J.

NEW SYSTEM OF COTTON CULTIVATION.

The system which is here described and recommended has been successfully tested in several localities of the United States, both by the Bureau of Plant Industry of the Department of Agriculture and by practical farmers.

The way to secure an early short-season crop of cotton is to thin the plants later and leave them closer together in the rows than is now customary. Neither of these policies is advisable if used alone, but they give a real advantage when properly combined. Keeping the plants closer together during the early stages of growth restricts the formation of vegetative branches and induces an earlier development of fruiting branches.

The spacing of the plants and stages at which thinning should be done will depend upon local conditions and will have to be determined experimentally in every case.

So long as the plants are close together they do not form vegetative branches; hence by thinning them when the stalks have grown beyond the stage in which vegetative branches are produced, the latter are controlled or suppressed. This makes it possible to leave more plants in the rows than is now customary and yet avoid injurious crowding.

The control or suppression of the vegetative branches also permits an earlier development of fruiting branches and leads to the production of an earlier crop. In regions where the period of crop production is limited either by short seasons or by the presence of the boll weevil, increased earliness is a means of securing larger yields. Hitherto no other way has been suggested whereby it is possible for the farmer to gain such direct control of the behaviour of his crop and to ensure larger yields in short seasons. The danger of weevil injury is greatest under conditions that favour the luxuriant growth of the young plants and induce the formation of large numbers of vegetative sterile branches, and it is under such conditions that the control of the formation of branches becomes most effective as a method of weevil resistance.—BULLETIN INT. INST. OF AGRIC.

QUEENSLAND-GROWN COPRA.

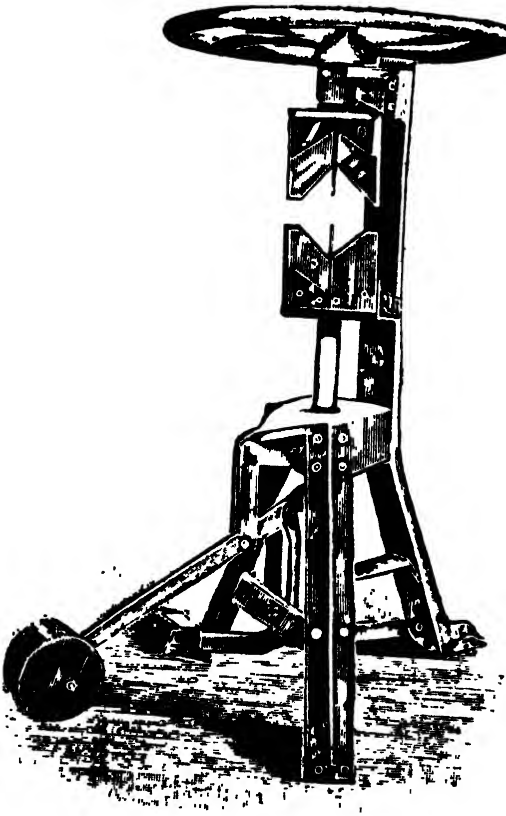
In the last issue of the "Journal" (January, 1916) we published the results of an analysis of copra made from coconuts grown at the Kamerunga State Nursery, Cairns, which showed that the Queensland product compares very favourably as to the oil contents with copra from the West Indies, Mauritius, Cuba, the Philippines, &c. Since then, a communication has been received by His Excellency the Governor, Sir Hamilton J. Goold-Adams, G.C.M.G., C.B., from the Imperial Institute, London, dated 5th November, 1915, in which further valuable information is given in connection with a sample of Queensland copra, which was forwarded to the Imperial Institute by His Excellency on the 12th July last. This despatch was handed to the Minister for Agriculture and Stock, and we have been permitted to make the following extract therefrom:—

"It was supposed by some that the Queensland coconuts do not contain sufficient oil to be of commercial value, and this sample was therefore sent in order to test the point. It was produced at the Kamerunga State Nursery, near Cairns. By analysis, it was found to contain 4·4 per cent. of moisture, and yielded 64·6 per cent. of oil, equi-

valent to 67·6 per cent. of the dry copra. The oil possessed the usual character of coconut oil, and was of good quality, acidity being very low. The yield of oil was quite equal to the amount furnished by other varieties of copra. Kiln-dried copra is stated to yield from 62 to 65 per cent. of fat, while, dried in hot air, a higher yield, often to 74 per cent., is recorded. There is no doubt that copra containing 67·6 per cent. of oil in the dry material would meet with a ready sale if placed on the market in good condition.

"The sample was submitted for valuation to a firm of oil-seed crushers, who also treat copra, and also to a broker. The former reported very favourably on the quality of the copra, pointing out that it would be very desirable to reduce the amount of moisture from 4·4 per cent. to about 3 per cent. The sample was valued at £25 per ton, c.i.f., London (11th October, 1915). A little extra drying, and breaking the copra into smaller pieces, would increase the value by about 10s. per ton. The broker described it as a good sun-dried copra, and valued it at £24 15s. per ton. For comparison of valuations of the chief commercial varieties of copra in London, a list of quotations is appended to the despatch, in which Malabar (on 13th October, 1915) headed the list with £26 15s. per ton, the lowest being Zanzibar and South Sea, valued respectively at £24 5s. and £23 15s. per ton.

"The results of the investigation show that Queensland copra contains a normal amount of oil, and that commercial shipments would be readily saleable in London at good prices, especially if care were taken to dry the copra, so that it contain not more than 3 per cent. of moisture."



ANALYTICAL TESTS MADE AT THE LABORATORY OF THE CENTRAL SUGAR EXPERIMENT STATION, AT MACKAY, FOR THE PURPOSE OF DETERMINING THE RELATIVE RICHNESS OF H.Q. 426, BADILA, GORU, CHERIBON, MALABAR, AND OTAMITE.

It will be remembered that last year we published tables supplied by the Bureau of Sugar Experiment Stations, showing the average per cent. of pure obtainable cane sugar and the quotient of purity of the varieties known as H.Q. 426, Badila, and Goru, *versus* Cheribon, Malabar, and Otamite. These concerned the plant crop which comprised early and late planting—viz., March and August, 1913. In those tables it was shown that, for an average of seven months, the first three canes were much superior to the latter. Those findings have been confirmed by the tests of the first ratoon crops of these varieties made from June to December, 1915. For the purpose of comparison, we give the results of the plant and first ratoon crops side by side:—

Variety.	Plant Crop. Average, 7 Months' Analyses.		1st Ratoon Crop. Average, 7 Months' Analyses.	
	Early Planting. P.O.C.S.	Late Planting. P.O.C.S.	Early Planting. P.O.C.S.	Late Planting. P.O.C.S.
	%	%	%	%
H. Q. 426	16·0	16·6	18·4	18·8
Badila	15·1	16·6	19·8	18·7
Goru	13·2	13·9	17·0	16·4
Cheribon	12·6	12·6	15·6	15·5
Malabar	11·8	11·8	15·0	15·3
Otamite	11·0	11·4	15·0	15·0

In the above table it will be noted that the general results from the first ratoon crop are a good deal higher than from the plant crop. This was no doubt caused by the dryness of the season, which had a marked effect in increasing the density of the cane in almost every sugar district.

From the tables presented below, the superiority of the first three varieties over the Cheribon, Malabar, and Otamite for the whole seven months is plainly seen. As in the results of last year, the latter varieties do not begin to show up till September. For the last three months of the year they are fairly good. H.Q. 426, as pointed out last year, appears to lose sugar after October, thus bearing out its character as an early maturing cane. These experiments, we are informed by the General Superintendent of Sugar Experiment Stations, were instituted at the request of the Mackay Manufacturers' Association of Mackay, and they are of more interest to that district, because scarcely any of the varieties known as Cheribon and Otamite are grown in other sugar districts, whereas in Mackay they form a large proportion of the crop. The figures, however, are interesting to all growers of cane, particularly in view of the investigations of the cane prices boards.

ANALYTICAL TESTS OF 1ST RATOON CANE FROM EARLY PLANTING IN MARCH, 1913.

Variety.	June (8 months).		July (9 months).		August (10 months).		September (11 months).		October (12 months).		November (13 months).		December (14 months).	
	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
H. Q. 426 ..	89·5	13·8	89·1	15·0	92·4	15·8	92·7	17·3	93·2	18·3	92·3	15·6	91·3	15·0
Badila ..	93·7	15·1	93·4	16·3	93·9	18·0	92·3	18·0	91·8	17·9	91·8	16·9	93·1	17·1
Goru ..	85·8	10·6	87·3	13·4	91·2	15·2	92·2	16·2	92·1	17·4	92·7	15·3	92·3	14·1
Cheribon ..	79·5	9·5	84·0	11·5	84·9	11·9	88·1	14·4	90·0	15·1	92·6	15·5	92·8	16·1
Malabar ..	69·1	7·2	85·5	12·4	84·7	13·2	87·5	13·8	86·7	14·4	90·6	14·3	90·3	15·1
Otamite ..	67·2	7·1	81·8	10·9	88·4	13·8	87·0	14·1	90·4	14·7	90·0	14·3	91·7	15·1

ANALYTICAL TESTS OF 1ST RATOON CANE FROM LATE PLANTING IN AUGUST, 1913

Variety.	June (8 months).		July (9 months).		August (10 months).		September (11 months).		October (12 months).		November (13 months).		December (14 months).	
	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.	Purity.	P.O.C.S.
H. Q. 426 ..	87·9	13·2	92·1	15·2	93·6	16·6	92·7	17·6	94·4	17·4	93·0	16·5	94·0	16·5
Badila ..	88·1	13·5	92·4	15·7	90·0	14·3	92·4	17·4	93·2	18·4	91·0	16·8	93·3	16·2
Goru ..	78·6	9·6	86·0	12·2	89·2	13·4	92·4	16·9	92·3	16·1	92·0	16·0	92·2	14·3
Cheribon ..	78·1	8·9	82·8	11·1	79·9	12·2	86·8	14·2	90·1	15·5	91·7	15·9	91·5	15·6
Malabar ..	76·5	8·8	82·8	11·9	89·5	14·3	86·5	13·2	89·9	15·6	89·5	14·1	89·8	14·4
Otamite ..	78·6	9·4	80·0	10·2	89·3	14·4	88·2	13·9	92·7	14·4	88·9	13·9	89·7	14·3

Entomology.

COMBATING THE CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. E. Jarvis, Entomologist to the Bureau:—

I have to submit the following progress report for November, 1915:—

An inch of rain was recorded by the Mulgrave Mill during this month, the fall, however, varying in different localities and being insufficient to establish soil conditions suitable for a general emergence of the "Grey-back Cockchafer" (*Lepidiota albohirta* Watern.). Two root-eating scarabaeid beetles of minor economic importance, belonging to the genera Dasygnathus and Anomala, made their appearance in the canefields about the 15th instant.

It has been deemed advisable to commence a study of the topography of Gordonvale in order to determine as far as possible the relation of topographical conditions to influences arising from the operation of various methods of agricultural and natural control.

The importance of this branch of research cannot be over-estimated, since it affords a means whereby we may arrive at a feasible solution of such questions as the following:—

(1) Why did our "grey-back" cane-beetle attack sugar-cane in the first instance?

(2) Why do certain localities, such as Greenhills, &c., continue to be seriously grub-infested, while others are either unaffected or comparatively free from attack?

(3) Why are canefields in certain limited areas free from grubs, but adjoining plantations either permanently affected or liable to gross infestation for a few seasons followed by long intervals of freedom from the pest?

A detailed account of observations in this connection will form matter for special report later on, but it may not be out of place at present to allude very briefly to a few significant phases of the question.

Referring, for example, to the destruction of feeding trees as a means of repression against the adult beetle, I find that the success of this method of procedure depends to a very great extent on such factors as the geographical position of an affected area, its surrounding soil conditions, and the character, disposition, and relative abundance of timber

in the vicinity. This being so, it follows that, although of supreme importance as a practical remedy, the indiscriminate cutting down of all trees—even when including food-plants of the beetle—is not to be recommended in every case.

Such action, indeed, instead of affording relief may in some instances even tend to aggravate the evil. I am indebted to the courtesy of the manager of Mulgrave Mill and various residents and growers in the district for information respecting degrees of infestation in different canefields, and other details more or less helpful. Preliminary investigations relating to this important side of the question have already resulted in discoveries of more or less economic value, further mention of which, however, would not only be premature in a report of this kind, but necessitate reference to specially prepared topographical maps which cannot be given here, but which will, it is hoped, serve to illustrate a pamphlet dealing with this subject in the near future.

The following interesting circumstance regarding the effect of drought conditions on beetles unable to tunnel through dry ground has just been brought under my notice. It appears that whilst preparing volcanic soil for plant-cane at the "Carrah" Estate, Gordonvale, on or about 28th November, dozens of dead grey-back cockchafers were turned up in the drills, no living ones being observed. The depth of ploughing on this occasion was one foot, in ground fairly loose near the surface but very dry. As previously reported, the above species assumed the adult form about the middle of September, from which we may infer that in certain soils this beetle is probably unable to remain alive during dry weather longer than about ten weeks. Further details in connection with this matter will appear in my next report.

TREATMENT FOR LUMBAGO.

A writer in the "British Medical Journal" advocates the following method of curing lumbago in its acute stage without its being allowed to become chronic:—

(1) Deep thumbing of the lumbar (loin) muscles, during which a painful area is usually found either in the middle line or to one or other side; (2) fixing the part of the vertebral column below this painful region by firm pressure of the thumb on each side of the spine; and (3) making the patient perform movements of flexion, acute dorsiflexion, lateral flexion, and rotation. The result is that the patient is able to at once return to his work, and in no case has the writer had to repeat the process.

Science.

THE TANNIN CONTENTS OF SOME QUEENSLAND BARKS.

BY J. C. BRÜNNICH, F.I.C., AND A. T. JEFFERIS.

The extensive importation to this State of barks and tannin extracts has suggested the advisability of thoroughly investigating our native resources in this respect.

Some years ago a series of analyses were conducted by this Department and published in the "Agricultural Journal" of August, 1911, under the title "Some Queensland Mangrove Barks and other Tanning Materials," by J. C. Brünnich and F. Smith. Some high percentages of tannin were noted, but the difficulty of obtaining extracts in which the amount of colouring was not too high for the production of good leather mitigated against the adoption of these barks for tanning.

With the improvement, however, in decolourising processes, such bark will undoubtedly become of economic value.

With the view of commencing a general survey of Queensland barks, we have analysed a number, particularly from those woods which are valuable for timber, as, should the bark of such be found to contain fair percentages of tannin, a valuable by-product of the timber industry might be saved and utilised.

We are indebted to N. W. Jolly, Director of Forests, for the collection and description of the majority of samples, also to the Assistant Government Botanist (C. White), for the supply and identification of certain samples.

As will be seen, the results in the majority of cases were negative. Certain samples, however, yielded a fair percentage of tannin.

The results were tabulated in three divisions:—

No. 1.—Barks containing over 20 per cent. of tannin. Such should have direct value as tanning material.

No. 2.—Barks containing between 10 per cent. and 20 per cent. of tannin. These might become of value for the making of extracts, particularly where the bark occurs on large trees which are felled for timber.

No. 3.—Barks containing 10 per cent. of tannin. These are probably valueless, though some of the higher ones might be of use for extracts.

As regards Acacias, *A. implexa* is rich in tannin and should be of value.

The "Black Wattle" we were, unfortunately, unable to identify, the bark only being supplied.

"Brigalow," *A. harpophylla*, is of considerable interest, being widely distributed throughout the near West and common on our pear-infested land. It is used locally for tanning purposes, especially the inner bark.

"Tallow-wood," *E. microcorys*, is a coastal tree, but is becoming rather scarce.

"White" or "Scrubby Gum," *E. haemastoma*, occurs on poor dry ridges in our South Coast districts, and is used largely for fencing and firewood.

Gympie "Messmate," *E. Cloeziana*, occurs fairly abundantly in the neighbourhood of Gympie. The tree is large and yields a useful hardwood. Though the bark as a whole is not very high in tannin, it will be seen that the inside bark, which is approximately one-half the total thickness, contains considerably over 20 per cent., and might be of considerable value.

The following are the analyses of samples collected:—

NO. 1 DIVISION—OVER 20 PER CENT. TANNIN.

Name.	Local Name.	Per Cent. Moisture.	Per Cent. Soluble Solids.	Per Cent. Non Tannin.	Per Cent. Tannin.
Acacia sp.	Black Wattle ..	9·38	34·60	9·72	24·88
A. implexa	..	6·50	30·30	8·02	22·28
Eucalyptus Cloeziana (inside bark)	Gympie Messmate	7·42	31.50	8·02	23·48

NO. 2 DIVISION—OVER 10 PER CENT. TANNIN.

Name.	Local Name.	Per Cent. Moisture.	Per Cent. Soluble Solids.	Per Cent. Non Tannin.	Per Cent. Tannin.
Acacia Cunninghamii ..	..	3·05	22·98	5·36	17·62
A. arundelliana	..	5·50	25·78	8·32	17·46
A. neriifolia	..	5·15	22·65	11·30	11·35
A. harpophylla	Brigalow	5·24	30·24	14·10	16·14
Eucalyptus paniculata ..	..	10·35	23·16	8·63	14·53
E. microcorys	..	8·13	29·44	11·78	17·66
E. haemastoma	..	9·45	21·92	9·95	11·97
E. Cloeziana (whole bark)	Gum-topped Ironbark	6·30	18·55	6·40	11·95
Alphitonia excelsa . ..	Red Ash	8·00	15·62	4·48	11·14
	White Pine ..	..	..	..	11·50

No. 3 DIVISION—UNDER 10 PER CENT. TANNIN.

Name.	Local Name	Per cent. Tannin.
Acacia Cunninghamii (Young)	..	8·07
Acacia sp.	Scrub Wattle	8·50
Acacia sp.	Narrow-leaf Wattle	3·30
Eucalyptus maculata	..	5·82
E. acmenioides	..	3·36
E. propinqua	..	7·54
E. corymbosa	Bloodwood	3·20
Melaleuca	..	·8
E. tereticornis	Blue Gum	4·0
E. eugenioides	Yellow Stringy Bark	3·64
Litsea ferruginea	Bally Gum	2·1
E. citriodora	Scented Gum	3·3
Eucalyptus sp.	Ironbark	6·7
Callitris parlatorei	..	·80
Tristania suaveolens	..	4·10
Syncarpia laurifolia	Turpentine	4·0
Endiandra insignis	Boombun	·79
Dysoxylon cerebriforme	Braintree	1·36
	Rosewood	·62
Carnaevonia araliaefolia	Red Oak	1·6
Tarrietia argyrodendron	Crowfoot Elm	4·0
Gmelina fasciculiflora	White Beech	0·40
	Sarsaparilla	3·33
Castanospernum australe	Bean Tree	·57
	Nettlewood	1·3
Eucalyptus pellita	Forest Mahogany	1·0
Podocarpus pendunculata	Black Pine	8·3
Melaleuca sp.	Tea-tree	·31
Casuarina Cunninghamii	River Oak	4·3
	White Silky Oak	2·7
Flindersia pubescens	Ash	·70
Aleurites moluccana	Candlenut	2·3
Embothrium Wickhamii	Pink Silky Oak	·8
Sterculia sp.	Kurragong	4·9
Myristica insipida	Nutmeg	·5
Cardwellia sublimis	Bull Oak	5·0
Flindersia Chatawaiana	Red Beech	4·5
	Ribbonwood	·7
Eugenia sp.	Scrub Mahogany	8·3
Melia composita	White Cedar	2·5
Dysoxylon Pettigrewianum	Satinwood	1·1
Cryptocarya Palmerstonii	Black Walnut	2·8
Amoora nitidula	Jimmy-Jimmy	2·8
Daphnandra aromatica	Sassafras	3·0
	Box	1·1
	Blackbutt	5·2
Dysoxylon Muelleri	Miva	trace
	Tallowwood	4·1
Elaeocarpus grandis	Quondong	5·7

General Notes.

THE BRITISH DYEING INDUSTRY.

Shortly after the outbreak of the war the Government appointed a committee to examine the prospects of the British dyeing industry, one of its most promising members being Professor Arthur Green, the head of the dyeing department at Leeds. The work of this committee was directed to the twofold object of supplying immediate needs and of placing the British dye industry upon a firm footing for the future. Even more important than the establishment of a national dye company is the research work instigated by the committee, by means of a grant, at Leeds University. The Leeds laboratories are admirably equipped for work of this kind. Here, under the direction of Professor A. G. Perkin, the son of the founder of the artificial dyestuffs industry, and of Professor Green himself, a number of chemists are hard at work upon researches into the nature of the intermediate products from which synthetic dyes are made. Among them is Dr. Oesch, a Swiss subject, who has studied at several of the principal German factories. The results, we are told, have already been striking. A number of important intermediate products have been worked out which were previously only known to German manufacturers. Among them may be mentioned the product from which the dye known as "indanthrene" is made. This is a well-known blue, familiar in curtains such as the "Sundown." It is the fastest blue known, faster even than indigo. Many of the other researches are of too technical a nature to be described here, but among them may be mentioned a successful investigation of the composition of "Stilbene," an important product from which many useful yellows and oranges are derived. It is one of the most important of the dyes used upon cotton. It was in the Leeds laboratory that the constitution of the famous "aniline black" was first brought to light—a problem which had long baffled chemists in all parts of the world, including Germany. It is added that the authorities, not content with the variety of shades of khaki which have been in use during the last year, are now insisting upon exact conformity to the standard. This has brought a number of urgent technical problems into prominence. For instance, there is the difficulty of blending worsted so as to avoid colour bars in weft. This is due to the fact that the worsted trade—unlike the woollen—endeavours to preserve the length of the thread instead of dividing it, and it is difficult to do this in the blending process described above. A number of worsted firms, however, have now solved this difficulty, and the result is a khaki of standard shade which will wear for ever. There is, therefore, no reason why worsted should not be used equally with wool for clothing our soldiers. Such, at least, is the opinion of Mr. Howard Priestman, a member of the staff of the Textile Department at Leeds University, who is engaged in testing khaki cloths for the Government.—"Manchester Guardian."

WATERPROOFING UNIFORMS.

The French Army authorities, says "Popular Science Siftings," were faced with the necessity of providing an inexpensive and effective means of waterproofing the uniforms of their soldiers. A chemist has come to their rescue with the information that the fat extracted from wool while in the process of cleaning it for manufacture will serve their purpose. Experiments prove that the chemist is right. The waterproofing is done by reducing the wool fat to a liquid by the use of a solvent and diluting it with benzine or naphtha. The garment is soaked in this solution for a few minutes. It dries in a short time. Neither the colour of the article nor the fabric is impaired by the treatment.

DESTRUCTION OF RATS.

We are very frequently appealed to for advice as to how to get rid of rats on the farm, the sugar plantation, and the suburban house. The following notes on the various means adopted for the destruction of these rodents embody all that we have been able to collate on the subject. In future, if our correspondents will apply for a leaflet on rat-traps and poisons, they will receive one which will give the advice contained in the following suggestions:—

RAT POISONS.

1.—Any effective means of destroying the rats which are so destructive in our canefields will be welcomed, and not only by canegrowers, but by townspeople all over the State. Amongst the poisons recommended by the "Hawaiian Forester" are the following:—

Barium Carbonate.—One of the cheapest and most effective poisons for rats and mice, without taste or smell, and in the small quantities used in poisoning rats and mice is harmless to larger animals. Its action is slow but sure, and has the further advantage that the animal, before dying, if exit be possible, usually leaves the premises in search of water.

The poison may be spread on bread and butter, or more conveniently in ordinary oatmeal made into a stiff dough with one-eighth of its bulk of barytes.

OTHER POISONS.

2.—(1.) Arsenic, 2½ lb.; cooked rice, 6 lb.; powdered glass, 2 lb.; toasted cocoanut, 2 lb.

(2.) Arsenic, 2½ lb.; cooked rice, 6 lb.; brown sugar, 2 lb.; powdered glass, 2 lb.; toasted cocoanut, 2 lb.

When these baits were tried in a ricefield, the rats entirely disappeared after six days of continuous application.

(3.) *Ratin*.—The Ratin Laboratory, Gracechurch street, London, England, has put on the market a remedy which, whilst being deadly to rats and mice, is quite harmless to all domestic animals. The success Ratin has met with is remarkable. Recently all the rats on the island of Little Cumbrae were absolutely eradicated, the island being formerly

simply overrun by vermin. Equally good results have been noted in Grenada, Java, India, &c.

There are two kinds, the Ratin No. 1, which sets up a highly contagious disease, and which should, therefore, be used over large areas, and the No. 2, which is quicker acting, and which should be used where the vermin is congregated together, or after the use of the No. 1, where perhaps a few rats remain.

The poison is sold in tins of 6 oz., price 3s.; 2 lb. 3⅕ oz., 12s. 6d. The 6-oz. tin of No. 2 Ratin costs 3s. 6d., and the larger tin 15s. For mice, Ratin is sold in bottles containing 2⅗ oz., price 2s. 6d.

OTHER METHODS.

3.—Take a large earthen jar and set it in the ground near a building frequented by rats. The top should not be more than an inch or two above the surface of the ground. Fill this to within about 5 in. of the top with bran. Place boards over it, but leave a crack wide enough for a rat to easily enter. Let this set for several days and nights, until the rats have got into the habit of visiting it. Then take out the bran and fill with water to within 6 in. of the top, and on this sprinkle a covering of bran about 2 in. thick. Cover as at first, and every rat that has been in the habit of visiting the jar will unhesitatingly jump in, and once in there is no escape for him. He sinks, and the floating bran hides him from sight of the next victim. By once more filling the jar with bran and leaving it for several days before filling again with water, suspicion will be diverted. If there is no convenient place for setting the jar in the ground where it will not be disturbed, good results may be secured by placing a board in such a position that the rats can easily climb into the jar.

4.—A Florida farmer entirely got rid of rats in the following manner:—On some pieces of shingles he put about a teaspoonful of molasses, and on that a small quantity of concentrated lye. He placed these about the corn cribs. Next morning he found forty dead rats and the rest had left the farm for parts unknown. He said he had never known this remedy to fail.

The lye is made of caustic soda. Mix it with the molasses to the consistency of a paste. Smear on a board or shingle and place the board near a rat hole. All that is needed is for the rats to run over the smeared surface. The lye sticks to their feet and burns them. Then they lick their feet, after which performance they will cease to trouble you.

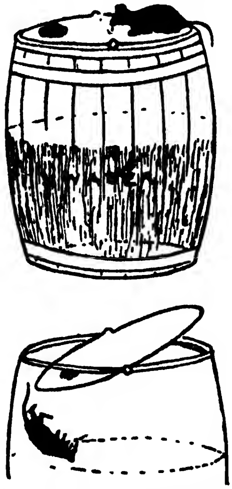
5.—We have been asked to suggest a plan for destroying rats, which often cause havoc amongst the sugar-cane. Some years ago (1899) the late Mr. E. Long, of Habana Plantation, Mackay, adopted with much success the following plan:—As soon as the crop was off (as nothing can be done amongst full-grown cane) great slaughter was caused by laying baits of ripe cane; the cane being split into two or more pieces, 6 in. long, and saturated by dipping in a 2 per cent. solution of strychnine. As long as there was little new cane to be got, these baits proved an irresistible attraction to the rats; after the cane was up the rats were

not so keen, and a new medium of bait had to be tried. The following was the most successful:—Green sweet potatoes sliced up into small pieces (the small tubers were mostly used), allowed to dry for twenty-four hours, and then, as with the cane bait, dipped in a 2 per cent. solution of strychnine. These were freely taken by the rats, of which large numbers were destroyed.

6.—Another simple plan, said to be very effective, is worthy of trial: Dress plenty of bits of straw with strong birdlime, and spread these thickly on the ground around the burrows. Amongst the straws throw some attractive bait—barley or malt sprinkled with oil of carraway is a good draw. Next morning the straws will be found gathered up in little bundles, and in the centre of each will be found a rat, dead or alive.

THE BARREL TRAP.

7.—The device shown is one that has been frequently used to trap native cats and other vermin. In London at the present time it is the means of destroying thousands of rats in large cellars and warehouses.

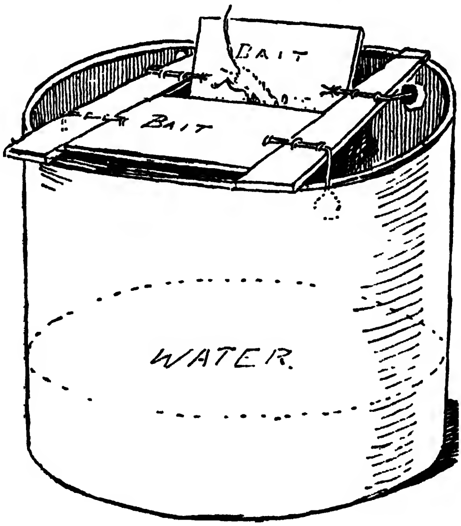


The barrel should be let in so that the swinging door is about level with the floor, but, if this it not practicable, spars or boards should be placed from the walls or the floor to the edge of the barrel, so that the rats can run along to the bait. The swinging cover must work easily, so that when the rat's weight is felt it tips instantly, and does not give the rat a chance to jump for the edge. With a piece of toasted cheese firmly fixed on the cover, a number of rats can be induced to "walk the plank" in a single night. At present it would be wise to put fluid or disinfectant in the water. The water should be deep enough to drown the rats, but not high enough up to allow them to climb up.

ANOTHER INGENIOUS TRAP.

8.—Take a common earthenware pot with, say, 4 in. of water at the bottom. Fix two boards across it as shown in the figure, and connect these by a transverse board divided in the middle, fixing each half by wire

hinges at the cross, and weighting it at each end with lead. The whole surface is now level, and the board is spread with bait. Now the rat steps forward, pop goes the trap door, down goes ratty, and the door adjusts itself to receive more, like a collecting box.



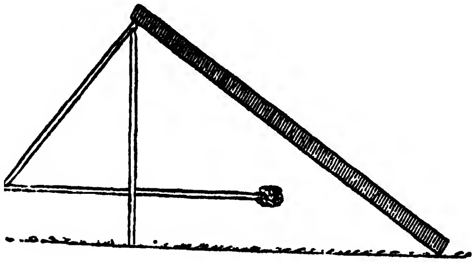
The uneducated rat of early summer is easily enough caught in any sort of trap, but as time goes on the young rats have learned the smell of the human animal, and detect it on the well-baited trap which has been too much handled in getting that fine adjustment which is essential to springing it easily.

Scent to Use.—This being so, it is desirable to employ some strong scent that will both mask the human odour and prove attractive to rats. At the head of these stands oil of rhodium, but it has the objection of being too expensive for any but the professional rat-catcher. Next in point of attractiveness is oil of aniseed. Bruised valerian root is liked by most rodents, but it has the great objection of mustering all the cats in the district, and even if you do not mind their late concerts, you do not want them to be caught in clams, or spring your trap to no purpose. Oil of aniseed is not too expensive if used with reasonable care, and seldom fails to draw. As proof of the scent of rats, a linseed cake was handled on three sides and not on the fourth, and then placed where rats came nightly, and they refused to touch the handled sides while eating the other.

AN EFFECTIVE TRAP.

9.—The "Dead Fall" is another homely trap which costs nothing and often does more execution than expensive engines purchased from the ironmonger. The lid of a box or a stout piece of planking, 15 to 20 inches long, and about the same width, should be set up for a night or two, supported at one end by a stick and a brick or two, to ensure its not falling while the rats make their supper under and around the innocent-

looking object. Meantime, three slips of wood, no stouter than will just support the board with a heavy stone on top, should be prepared. The



cut above will show how a figure 4 is made to act as a support until the movement of the bait acts as a lever, and down comes the weighted board on the animal beneath.

INTOXICATING RATS.

The following remedy may, we think, be taken with a large grain of salt:—

An American farmer tried all sorts of plans to get rid of rats, which played havoc with his corn, wheat, &c. Finally, he soaked a large amount of corn in whisky, placing it in a barrel where the rats could get at it. The plan was, according to his statement, a great success, and eighty-two of the rodents were killed owing to their abandonment of temperance principles.

SUGAR NOTES.

Replying to some questions which have reached us from Durban, South Africa, on yields of sugar from cane and beets, Mr. H. T. Easterby, General Superintendent of Sugar Experiment Stations, writes:—

1. The total amount of sugar in a ton of beets of good quality grown from pedigreed seed would be about 360 lb. The amount of total sugar in a ton of "Uba" containing, say, 14 per cent., would be about 313 lb. In a first-class variety of cane such as "Badila" it would run up to the same or even higher than the amount given for beet.

2. Density represents the total solids in the juice of the cane or beet, and is equivalent to its specific gravity. A good sugar-cane juice should contain on the average about 19 or 20 per cent. of total solids, including sugar. This would be stated in sugar parlance as 19 or 20 degrees Brix, and is equivalent to 10·5 or 11·1 degrees Beaume.

3. The expression ·5 is surely an error. Even 5 degrees Beaume would represent a very poor juice, and it would probably take considerably over 20 tons of cane of this quality to make 1 ton of sugar.

4. The cost of a sugar-making plant for cane or beet would be approximately equal.

Answers to Correspondents.

CARAVONICA COTTON SEED.

The cotton seed placed in our hands for gratuitous distribution has been already sent to applicants, and none is now available.

FERTILITY OF EGGS.

A. S. Norris, Humphery-Gradule.

Eggs should become fertile three or four days after the hens are placed with the rooster if the hens are laying. They will be fertile for ten to fourteen days after the rooster has been removed.

SHEEP NOTES.

J.H.T., Deeford—

Your questions were referred to Mr. W. G. Brown, Instructor in Sheep and Wool, who furnishes the following replies:—

"1. I would recommend for the Dawson Valley country Romney Marsh or Border-Leicester rams. If you can purchase crossbred ewes, on which to put them, then you would have a good, hardy, profitable cross for both mutton and wool.

"2. How to tell the age of a sheep. At twelve to fifteen months, the lamb teeth fall and two central teeth appear; at twenty to twenty-six months, two others come; at thirty to thirty-six months, two more; at forty to forty-eight months, two more, making eight incisors or cutting teeth.

"3. There must be wire netting to keep crossbred sheep in a paddock.

"4. Rhodes grass is a good sheep grass, even in winter.

"5. Spear grass, when not too rank, or in seed, is an excellent sheep fodder, but in seed it is death to sheep.

"It is impossible in the short space of a letter to give the whole business of sheep-breeding, but the pamphlets I send will give some insight into it, and common sense will give more. Experience is best of all. Try a few—say, fifty—ewes and watch them."

[Mr. Brown will be pleased to give any information required on the subject.]

PANAMA CANAL TRAFFIC FROM 15TH AUGUST, 1914, TO 14TH AUGUST, 1915.

"INTERESTED"—

The following information is published in the "Board of Trade Journal," London, 4th November, 1915:—

Ocean-going vessels passed through ..	1,317
Total gross tonnage of these vessels ..	6,534,853 tons.
Vessels passed from the Atlantic to the Pacific	656
Aggregate gross tonnage	3,307,096 tons.
Vessels passed from the Pacific to the Atlantic	661
Aggregate gross tonnage	3,227,757 tons.
Tolls earned during the year	5,216,149 dols. (£1,043,229 16s. 8d.)
Excess of earnings above expenses ..	230,833 dols. (£46,166 12s. 6d.)

The above figures, however, do not take into consideration the depreciation of plant, except in a few cases of minor importance, nor do they allow for interest on the money invested, nor for a charge to amortize the debt. A considerable amount of tolls will also be refunded on account of the ruling of the Attorney-General of the United States that the tolls shall not be greater than the equivalent of 1 dol. 25 cents (5s. 1¼d.) per net ton on the basis of measurements for registry in the United States. For the net tonnage, roughly, 1,000,000 tons may be deducted from the gross as given above.

NATIONALITIES USING THE CANAL.

	Number of Vessels.		Number of Vessels.
British	568	Danish	31
American	544	Swedish	27
Norwegian	53	Japanese	13
Chilian	41		

Besides 10 vessels belonging to France, Russia, Peru, Argentina, Holland, Italy, Honduras, Panama, Nicaragua.

PANAMA LANDSLIDES.

"This last slide of earth is the largest since the Panama Canal was opened to traffic. It is difficult to say how long it will be before it is ready for shipping.

"I am sending all the dredgers up to the Gaillard cut, where most of the sliding occurred. They will be kept busy night and day."

Colonel Goethals made this statement at Balboa.

Albert F. Pilsbury, the Minneapolis flour magnate, declared that it would be months before traffic could be resumed.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY, 1916.

Article.		JANUARY Prices.
Bacon	lb.	1s. 3½d. to 1s. 4½d.
Bran	ton	£9 15s.
Broom Millet	,,	£37
Butter	cwt.	125s.
Chaff, Mixed	ton	£12
Chaff, Oaten	,,	£6 10s. to £7 10s.
Chaff, Lucerne	,,	£13 15s. to £15
Chaff, Wheaten	,,	£6 10s. to £7 10s.
Cheese	lb.	11d. to 11½d.
Flour	ton	...
Hams	lb.	1s. 3d.
Hay, Oaten (Victorian)	ton	£6 10s.
Hay, Lucerne	,,	£9 15s to £10
Honey	lb.	3½d. to 3¾d.
Maize	bush	7s 1d
Oats	bush.	4s. 9d
Onions	ton	£6 to £6 10s.
Peanuts	lb	3½d. to 5d.
Pollard	ton	£11 10s.
Potatoes	,,	£16 10s. to £18
Potatoes (Sweet)	cwt.	10s. 6d.
Pumpkins	ton	£11
Eggs	doz.	1s. 3d. to 1s. 5d.
Fowls	pair	4s. to 6s.
Ducks, English	,,	4s. to 4s. 9d.
Ducks, Muscovy	,,	7s. to 8s.
Geese	,,	10s. to 11s.
Turkeys (Hens)	,,	10s. to 12s.
Turkeys (Gobblers)	,,	20s. to 35s.
Wheat	bush.	5s. 9d.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	4s. to 8s. 6d.
Beans, per sugar bag	4s. to 8s.
Beetroot, per dozen bunches	9d. to 1s. 3d.
Carrots, per dozen bunches	1s. to 1s. 3d.
Chocos, per quarter-case	...
Cucumbers, per dozen	6d. to 1s.
Custard Marrows, per dozen	2s. to 4s.
Vegetable Marrows, per dozen	2s. to 4s.
Peas, per sugar bag	5s. to 12s.
Parsnips, per dozen bunches	...
Celery, per dozen bunches	...
Sweet Potatoes, per cwt.	10s. 6d.
Table Pumpkins, per dozen	4s. to 7s. 6d.
Tomatoes, per quarter-case	3s. to 6s. 6d.
Turnips, per dozen bunches	...
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	JANUARY. Prices.
Bananas (Queensland), per case	10s. to 14s.
Bananas (Fiji), per case	21s. to 23s.
Bananas (G.M.), per case	...
Bananas (G.M.), per bunch	24s. to 25s.
Cucumbers, per case	6d. to 1s.
Granadillas, per double case	11s. to 12s.
Lemons (Local), per bushel case	4s. to 8s.
Mangoes, per case	2s. to 5s.
Oranges (Navel), per case	...
Oranges (other), per case	...
Passion Fruit, per half-bushel case	2s. to 6s.
Papaw Apples, per double-case	2s. 6d. to 4s.
Pineapples (Queens), per case	9s. to 12s.
Pineapples (Ripleys), per case	4s. 6d. to 7s.
Pineapples (Common) per case	4s. to 5s.
Rockmelons (Queensland), per case	12s. to 14s.
Strawberries (Queensland) per tray	...
Tomatoes, per quarter-case	3s. to 4s. 9d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	JANUARY. Prices.
Apples (American), per case	11s. to 12s.
Apples, Cooking, per case	7s. to 8s. 6d.
Apricots, per quarter-case	...
Bananas (Cavendish), per dozen	4½d. to 5½d.
Bananas (Sugar), per dozen	2d. to 4d.
Cherries, per case	...
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	...
Granadillas, per quarter-case	...
Lemons (Lisbon), per case	4s. to 6s.
Limes, per quarter-case	...
Mandarins, per half-case	...
Mangoes, per case	2s. to 5s.
Nectarines, per case	4s. to 6s. 6d.
Oranges (Navel), per case	...
Oranges (other), per case	...
Papaw Apples, per quarter-case	2s. 3d. to 3s.
Passion Fruit, per quarter-case	3s. to 5s.
Peaches, per case	4s. to 7s.
Peanuts, per pound	3½d. to 5d.
Plums, per quarter-case	4s. to 6s.
Pineapples (Ripley's), per dozen	2s. to 4s.
Pineapples (Rough), per dozen	1s. to 2s. 9d.
Pineapples (Smooth), per dozen	2s. to 3s. 6d.
Rockmelons, per dozen	1s. to 8s.
Rosellas, per sugar bag	...
Strawberries, per dozen pint boxes	4s. to 6s.
Strawberries, per tray	...
Tomatoes, per quarter-case	2s. 6d. to 5s. 6d.
Watermelons, per dozen	1s. 6d. to 6s. 6d.

TOP PRICES, ENOGGERA YARDS, DECEMBER, 1915.

Animal.	NOVEMBER. Prices.
Bullocks	£25 to £29
Bullocks (Single)	...
Cows	£17 2s. 6d. to £22 12s. 6d.
Merino Wethers	47s. 3d.
Crossbred Wethers	60s.
Merino Ewes	38s. 3d.
Crossbred Ewes	56s. 9d.
Lambs	41s. 6d.
Pigs (Porkers)	50s.

LONDON QUOTATIONS.

LONDON, 8th January.—The market for frozen rabbits is dull, owing to the large supplies. New South Wales blues, ex store, are quoted at 23s. per crate.

Jute, January-February shipment from Calcutta, £20 5s. per ton.

Hemp, March-May shipment, £41.

Rubber, fine hard Para, 4s. 0½d. per lb.; plantation first latex crepe, 4s. 3d.; smoked sheet, 4s. 3d.

Copra, South Sea, January-February shipment, £32 5s. per ton.

Raw linseed oil, spot pipes, £43 15s. per ton.

The Liverpool quotation for middling American cotton is 7·95½d. per lb.

Comparing these prices with the London quotations for the past three months, it will be seen that a very considerable advance has taken place in the prices of hemp, rubber, cotton, and copra, whilst jute has fallen from £25 15s. to £20 5s. per ton.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1915 AND 1914, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1915.	Dec., 1914.
North Coast.	In.		In.	In.
Atherton ...	7·19	13	9·15	3·86
Cairns ...	7·60	27	16·09	4·09
Cardwell ...	8·78	27	8 64	3·58
Cooktown ...	6·06	27	8·01	6·50
Herberton ...	5·29	27	8·56	3·67
Ingham ...	6·36	22	9 07	1·75
Innisfail ...	12·39	27	18 81	2·78
Mossman ...	11·55	5	14·00	5·40
Townsville ...	5·34	30	3·22	4·26
Central Coast.				
Ayr ...	3·65	27	1·88	2·92
Bowen ...	3·75	27	1·23	5·61
Charters Towers ..	3·08	27	5·06	4·80
Mackay ...	6·69	27	7·40	3·44
Proserpine ...	7·77	11	7·89	7·99
St. Lawrence ...	3·91	27	4·18	4·67
South Coast.				
Biggenden ...	5·11	14	2 39	1·80
Bundaberg ...	4·52	27	2·41	2·13
Brisbane ...	5·01	64	1·33	4·93
Childers ...	5·44	19	3·72	2·30
Crohamhurst ...	7·08	22	2·52	5·77
Esk ...	4·45	27	1·85	3·92
Gayndah ...	4·06	27	2 77	4·17
Gympie ...	6·48	27	7·57	2·52
Glasshouse M'tains	7·41	6	1·39	7 22
Kilkivan ...	4·46	27	3·58	1·25
Maryborough ...	4·40	27	2·37	1·89
South Coast—continued:	In.		In.	In.
Nanango ...	3·57	27	4·05	3·67
Rockhampton ...	4·39	27	2 03	5·07
Woodford ...	5·44	27	1·33	4 02
Yandina ...	6·89	21	2 79	4·81
Darling Downs.				
Dalby ...	3·23	27	2 18	2·80
Emu Vale ...	3 19	17	4·22	7 38
Jimbour ...	3·45	24	2·26	2·46
Miles ...	2·70	27	1·46	0·97
Stanthorpe ...	3·44	27	3·15	3·00
Toowoomba ...	4·10	27	4 55	7·89
Warwick ...	3·46	27	3·92	3·07
Maranoa.				
Roma ...	2·57	25	1·30	2·65
State Farms, &c.				
Gatton College ..	3·18	14	1·37	7·66
Gindie ..	2·76	13	1·15	0·64
Kamerunga Nurs'y	5·94	23	7·85	5·71
Kairi ...	6·50	3	8·06	3·65
Sugar Experiment Station, Mackay	7·92	16	8·47	2·47
Bungeworgorai ...	1·78	3	0·91	2·77
Warren ...	..	..	1·72	3·77
Hermitage ...	2·12	7	3·57	3·68

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December 1915, and for the same period of 1914, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE FIRST FOUR MONTHS OF 1916.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·58	5·46
2	4·57	6·45	5·21	6·42	5·42	6·18	5·59	5·45
3	4·58	6·45	5·22	6·41	5 43	6·17	5·59	5·44
4	4·58	6·45	5·22	6·41	5·43	6·16	6·0	5·43
5	4·59	6·45	5 23	6·40	5·44	6·15	6·0	5·42
6	5·0	6·46	5·23	6 39	5·45	6·14	6·1	5·40
7	5·0	6·46	5 24	6·39	5·45	6·13	6·1	5·39
8	5·1	6·46	5·25	6·38	5·46	6·12	6·2	5·38
9	5·1	6·46	5·26	6·37	5·46	6·11	6·2	5 37
10	5·2	6·46	5 27	6·37	5·47	6·10	6·3	5·26
11	5·3	6·46	5·27	6·36	5·47	6·9	6·3	5·35
12	5·4	6·46	5·28	6·35	5·48	6·8	6·4	5·34
13	5·5	6·46	5·29	6·35	5·48	6·7	6·4	5·33
14	5·6	6 46	5·30	6·34	5·49	6·6	6·5	5·32
15	5·7	6·46	5·30	6 33	5·49	6·5	6·5	5·31
16	5·8	6 46	5·31	6·32	5·50	6·4	6·6	5·30
17	5 8	6·47	5·32	6·31	5·50	6·2	6·6	5·29
18	5·9	6·47	5 32	6 31	5 51	6·1	6·7	5·28
19	5·9	6·47	5·33	6 30	5·51	6 0	6·7	5·27
20	5·10	6·47	5·34	6·29	5 52	5·59	6·8	5·26
21	5·11	6·46	5·34	6 28	5 52	5·58	6·8	5·25
22	5·12	6·46	5·35	6·27	5·53	5·57	6·8	5·24
23	5·13	6·45	5·36	6·26	5·53	5·56	6·9	5·24
24	5·13	6·45	5·37	6 25	5·54	5·55	6 9	5·23
25	5·14	6·45	5·38	6·24	5·54	5·53	6·10	5·22
26	5·15	6·45	5·38	6·23	5·55	5·52	6·10	5·21
27	5·16	6 44	5·39	6·22	5·55	5·51	6·11	5·20
28	5·17	6·44	5·40	6·21	5·56	5 50	6·11	5·19
29	5·18	6·44	5 41	6·20	5·57	5·49	6·12	5·18
30	5·19	6·43	...	...	5·57	5·48	6·12	5·18
31	5·20	6·43	...	.	5·58	5·47	...	...

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H.	M.	
5 Jan.	●	New Moon	2	45	p.m.
12 ,,	☾	First Quarter	1	38	,,
20 ,,	○	Full Moon	6	29	,,
28 ,,	☽	Last Quarter	10	35	a.m.

The moon will be partially eclipsed between 6 p.m. and 7 24 p.m. on January 20th. It will be at its nearest to the earth on the 4th at midnight, and at its greatest distance on the 17th at 3 p.m.

4 Feb.	●	New Moon	2	6	a.m.
11 ,,	☾	First Quarter	8	20	a.m.
19 ,,	○	Full Moon	12	29	p.m.
26 ,,	☽	Last Quarter	7	24	p.m.

The moon will be at its nearest to the earth on the 2nd at 10 a.m., and at its farthest on the 11th at 7 a.m. It will pass very close to the Pleiades on the 11th about midnight.

4 Mar.	●	New Moon	1	58	p.m.
12 ,,	☾	First Quarter	4	33	a.m.
20 ,,	○	Full Moon	3	27	,,
27 ,,	☽	Last Quarter	2	22	,,

The moon will be farthest from the earth on the 13th at 3 a.m., and nearest on the 28th at 11 p.m. It will pass over and occult the bright star, Antares, on the 25th between 4 a.m. and 5 a.m.

3 Apr.	●	New Moon	2	21	a.m.
11 ,,	☾	First Quarter	12	36	a.m.
18 ,,	○	Full Moon	3	7	p.m.
25 ,,	☽	Last Quarter	8	38	a.m.

The moon will be farthest from the earth on the 9th at about midnight, and at its nearest on the 21st at 9 36 p.m. It will be near the planet Neptune on the 11th at 7·30 p.m., but a good glass will be necessary to see the planet which will be rather more than the width of the moon to the south.

A total Eclipse of the Sun will occur on Feb 3rd, visible in parts of Central and South America, in parts of the Pacific and Atlantic Oceans, and partially only in Great Britain, France, Spain, &c.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 17 m., 28 m., 36 m., and 47 minutes, respectively, later than at Brisbane at this time of the year.

At Roma 15 minutes may be added to the Brisbane times for January and February, and about 17 minutes for March and April.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Farm and Garden Notes for March.

FIELD.—Take every opportunity of turning up the ground in readiness for sowing and planting winter crops. The main crop of potatoes should at once be planted. As the growth of weeds will now be slackening off, lucerne may be sown on deeply cultivated soil. The latter should be rich and friable, with a porous subsoil. The land should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. Prepare the land a couple of months before sowing, care being taken to cross plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed will be required; in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Lucerne seed is worth from £5 10s. to £6 10s. per cwt. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do any damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is now too late to sow maize, even 90-Day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and Swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola-nut cuttings. Some temperate-zone vegetables may be planted, such as egg plant, potatoes, &c. Coffee-planting may be continued. Harvest kafir corn and paddy.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, Jacobean, lilies, tigridia, tritonia.

All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Herbaceous plants and annuals which it is intended to raise from seed should be sown this month. Such are antirrhinums (snapdragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmea, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of

carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done.

Now, as to climbers which may now be planted. These are—*Allamanda Schotii* (beautiful yellow), *Antigonon leptopus*, a charming cerise-coloured climber; *Aristolochia elegans*, handsome as an orchid and easily grown; *Aristolochia ornithocephala* (Dutchman's Pipe), very curious, large, always attracts attention; *Asparagus plumosa* grows in any shady place; *Beaumontia grandiflora*, splendid white flower, grand for a fence, will grow 50 ft. high; Bignonias of several kinds: Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; *Quisqualis indica*, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the *Bauhinia scandens*, rarely seen about Brisbane. We grew a plant of this climber at Nundah, and it soon closed in the front of the veranda for a distance of over 80 ft. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossoms, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th of March. All unoccupied land should be roughly dug, and, where required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day and gathered, whether required or not, for, if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form inferior, ill-shaped, and hence unsaleable fruit.

Orchard Notes for March.

THE SOUTHERN COAST DISTRICTS.

The marketing of the main crop of pineapples will continue to occupy the attention of growers; and as it is probable that the plantations have been allowed to get somewhat dirty during the previous month, they should be cleaned up as soon as ever the crop has been got off. The fruit of the new crop of citrus fruit will be showing signs of ripening towards the end of the month; and as the fruit during this period of its growth is very liable to the attack of insect pests of various kinds, it is important that steps should be taken to prevent loss arising from this cause as far as possible.

Large sucking moths of several kinds attack the fruit as soon as it shows signs of ripening; and as they always select the first fruit that shows signs of colouring, it is a good plan to gather a few forward fruit and to ripen them up quickly by placing them on a barn floor, and covering them up with bags or straw. They will turn colour in a few days, and develop the characteristic scent of the ripening fruit. The fruit so treated should be hung up in conspicuous places in the orchard as trap-fruit, as not only will it attract the moths, but also the fruit-flies. The moths will be found clustered round the trap-fruits in large numbers, and can then be easily caught and destroyed. Fruit-fly will also puncture such fruit; and if the fruit is destroyed before the larvæ reach maturity, a later crop of these insects is prevented from hatching out. Fruit-flies may also be caught in large numbers by means of such artificially ripened fruits. The fruits are smeared with tanglefoot, and hung about the orchard. The fly, attracted by the colour, settles on the fruit, and is caught in a similar manner to house-flies on specially prepared sticky paper. These simple remedies, if carefully carried out, will result in the destruction of large numbers of sucking moths and fruit-flies.

The yellow peach-moth that does such damage to peaches in spring, and that attacks corn, sorghum, cotton bolls, custard apples, and many other plants and fruits, often does a lot of damage to citrus fruits. It acts in a very similar manner to the second and later generations of the Codling moth of pomaceous fruits, in that it lays its eggs where two fruits touch, under the shelter of a leaf on the fruit, at the stem end of the fruit, and, in the case of navel oranges, in the navel itself; in fact, anywhere that there is a likelihood of the egg not being disturbed. The

egg hatches out into a small spotted caterpillar, which eats its way into the fruit, causing it to ripen prematurely, and fall off. Where two fruits touch, it often eats into and destroys both, and it frequently leaves one fruit to go and destroy a second. It is a very difficult insect to deal with, owing to the number of fruits and plants on which it lives; but, as far as citrus fruits are concerned, the best remedy is undoubtedly to spray the fruit with a remedy that will destroy the young insect when it starts to eat the skin of the fruit. Bordeaux mixture has been found efficacious, but I am of opinion that spraying with Paris green and lime, Kedzie's mixture, or arsenite of lead, will also have good results. The latter poison is, in my opinion, well worth giving a thorough test, as it sticks to the fruit and leaves for a long time. Bordeaux mixture, either alone or in conjunction with Paris green or Kedzie's mixture, is, however, a good remedy, as not only will it destroy the larvæ or prevent the moth from attacking the tree, but it is also the best remedy for black brand or melanose, as well as tending to keep all other fungus pests in check. Fight fruit-fly systematically—both by means of the sticky fruit already recommended and by gathering all fly-infested fruit, such as guavas, late mangoes, kumquats, &c., as well as any oranges or mandarins that may have been infested, as if kept in check now there will be little loss throughout the season. A little fruit will be marketed towards the end of the month. See that it is gathered and sweated for seven days before marketing, and don't gather it too immature. Beauty of Glen Retreat mandarins are often gathered and marketed as soon as they show signs of colouring. They are then as sour as a lemon, and anyone who is unlucky enough to buy them will steer off mandarins for some time to come. This variety should not be gathered till thoroughly ripe, as when marketed in an immature state it spoils the market, as it puts people off eating citrus fruit.

Clean up the orchard after the summer rains, and have everything ready for the marketing of the crop. See that there is a good supply of clean, dry case timber on hand, as one of the greatest sources of loss in shipment is packing fruit in green cases.

Strawberry planting can be done throughout the month. Plant such berries as Federation on the lowest ground, and Aurie, Anetta, Trollop's Victoria, and Glenfield Beauty on warm, well-drained soils. Prepare the land thoroughly, so that it is in perfect tilth, and in a fit state to retain moisture well; as on this, as much as anything, the success of the crop depends. Where new orchards are to be planted, get the land ready—not the clearing, which should have been done months ago, but the working of the land, as it is advisable to get it thoroughly sweetened before putting the trees in.

THE TROPICAL COAST DISTRICTS.

The Notes for February apply equally to March. See that bananas are netted—keep down weed growth, and market any sound citrus fruits. Clean up the orchards as well as possible, and keep pines clean. Get land ready where new orchards are to be set out, as tree-planting can be done during April and May. Pines and bananas can still be planted, as they will become well established before winter.

THE SOUTHERN AND CENTRAL TABLELANDS.

Finish the gathering of the later varieties of deciduous fruits, as well as grapes. Clean up the orchard, and get ready for winter. Get new land ready for planting; and where there are old, dead, or useless trees to be removed, dig them out and leave the ground to sweeten, so that when a new tree is planted to replace them the ground will be in good order.

In the drier parts, where citrus trees are grown, keep the land well worked, and water where necessary.

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Agriculture.

PASPALUM.

Paspalum has proved itself to possess many excellent characteristics and abnormal stock-carrying capacity when grown under conditions congenial to its development. Apart from its value on scrub, and other classes of country, it has much to recommend it for sour, swampy situations. In respect to the specific inquiries made to the Agricultural Department of this State, it can definitely be stated that paspalum pastures, even when situated in the most favourable localities, commence to deteriorate after several years, owing to the abnormal root-development of the plant. The root system becomes very pronounced in the sense that a mass of interlocked root fibres results, which fibres form a dense mat excluding air and moisture, and, unless the rains are of a steady soaking character, the subsoil, under the circumstances, is not replenished with sufficient moisture to maintain a vigorous growth. Disc-ploughing and reworking of old paspalum pastures is the only effective method of giving the grass a new lease of life.

MANURING FOR POTATOES.

Potato crops, more than any other, may unquestionably be profitably increased by the use of artificial fertilisers, but, as the crop is dependent quite as much upon the season as upon the fertiliser, it may happen frequently that manuring does not appear to give much better results.

Again, manuring will only be of use if combined with effective cultivation.

The effect of artificial fertilisers may become considerably increased by the addition of farmyard manure, which by itself is one of the best manures for potatoes when applied early as the land is being got ready. As the heavy amounts (10 to 20 tons per acre) of farmyard manure, which would be necessary if used by itself, for a complete dressing, are not always available, smaller quantities of 3 to 6 tons per acre may be used profitably in addition to artificial fertilisers.

As a rule, complete manures give by far and away the best results, and may even be used in small dressings in comparatively rich soil, and will then prevent their rapid exhaustion.

The dominant manure for potatoes is potash, and it appears that potassium chloride gives better results in some cases than the potassium sulphate. As our soils are generally rather high in chlorides, the use of potassium sulphate is to be preferred, and it may be used in quantities from 1 to 2 cwt. per acre, according to the quality of the soil and the presence of available potash.

Nitrogen.—Nitrogen is only required in moderate quantities, and gives the best results if applied in the form of nitrate of lime, cyanamide or nitrolin, or of dried blood, which may be used in quantities from 1 to 2 cwt. per acre. This element has at times a somewhat forcing effect on plants, and under some circumstances may act in a detrimental manner. For instance, should the spring crop receive a check from dry weather just as the tubers are setting and this be followed by thunderstorms and heat, there is an over-luxuriant growth of tops, and the energies of the plant are misdirected, with a consequent reduction in yield.

Phosphoric Acid is generally applied, in the form of superphosphate or bonedust, in quantities of from 2 to 4 cwt. per acre.

When a complete mixed fertiliser is to be used, such a one should be chosen which contains from 8 to 12 per cent. of phosphoric acid, 3 to 4 per cent. of nitrogen, and 8 to 9 per cent. of potash, and in quantities of not less than 6 cwt. per acre on soils considered to warrant the application of such dressings. Local conditions vary very much, and are of greatest importance, and even have such an influence on the composition of the soil that an ordinary agricultural analysis may not always be a safe guide; for this reason, small experimental plots are recommended, where the quantity and kind of fertilisers may be gauged to suit the

class of soil and other controlling influences. These may be designed as follows:—

1. Unmanured.
2. Nitrogen and potash.
3. Potash and phosphate.
4. Unmanured.
5. Nitrogen, potash, and phosphate.
6. Nitrogen, potash, phosphate, and stable manure.

The Application of Artificial Fertilisers.—A concentrated fertiliser is more readily distributed by mixing it with several times its own bulk of sifted soil. If applied directly to the furrows, the root system of the plants is confined to a more limited space, and the crop will suffer to a greater extent in dry weather than if the fertiliser was spread over the land and ploughed or worked in just previous to planting. This is to be commended when the more slowly assimilible fertilisers are used; for others, exclusive of the most soluble kinds, broadcast the fertilisers over the open furrows before planting. The covering in of the crop will tend to incorporate it with the soil. The soluble fertilisers supplying the nitrogen are usually distributed between the rows by hand when the plants are several inches in height, and this is followed up by scuffling the crop.

Farmyard Manure.—Apart from the manurial constituents contained, it acts as a mechanical improver of the soil, providing humus to surround the soil particles, and preventing plasticity; this, as already noted, is of extreme importance in connection with potato-raising. Usually this class of manure will contain from ½ to 1½ per cent. of useful plant food (N.K.P.), but many things have influence on its value; for instance, its origin, the manner and length of time it has been stored, the nature and quantity of food and litter supplied, and the ages of the animals, &c.

If stored and rotted down in pit or heap, it is reduced to a pasty mass, and much valuable material is lost by fermentation and by its depreciation as a mechanical improver of the soil.

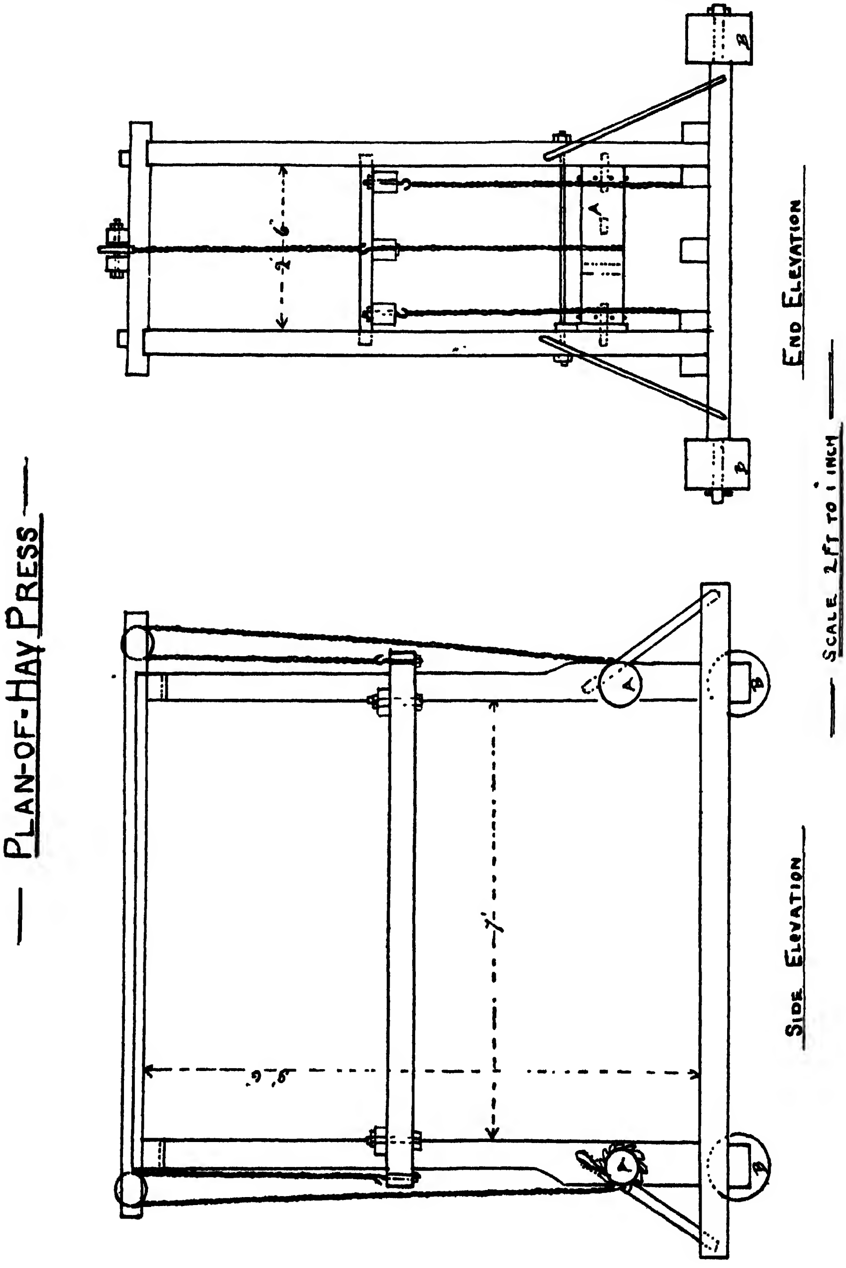
In temperate climates it is customary to apply in drills and plant the potatoes on the manure with satisfactory results; but in this climate it is best carted direct from the sheds to the paddock to be manured, and ploughed in some time before planting. This allows for a more complete decomposition.

Green Manure.—To maintain that loose friable state of the soil so necessary in the production of potatoes, and to improve the mechanical condition of lighter soils deficient in vegetable matter, and of soils which have depreciated in texture from continuous cultivation, the practice of growing and "ploughing in" a leguminous crop as a soil renovator, allowing it to rot down in the season prior to the planting of the potatoes, is commended. Ordinary field and cowpeas are both useful for the purpose —the former adapted for growing from autumn to early spring, and the latter from the latter time to early autumn. Another useful crop for sowing in autumn is rape.

HOME-MADE HAY PRESS.

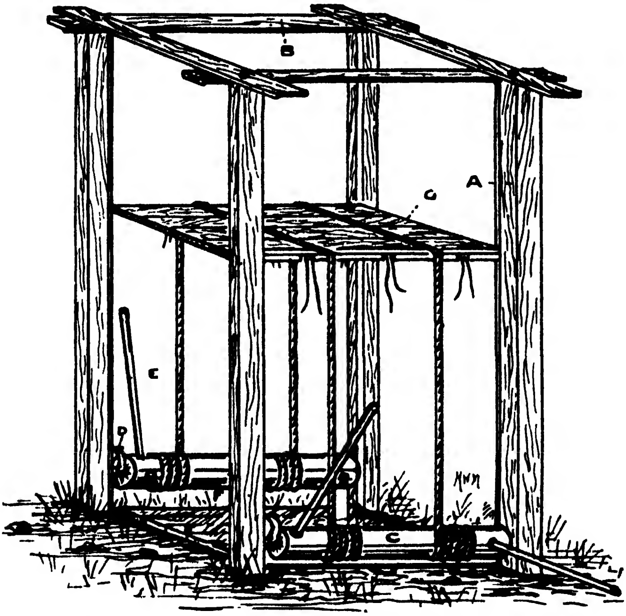
In response to a request from a correspondent, Mr. Cuthbert Potts, Principal of the Queensland Agricultural College, Gatton, furnished the accompanying diagram and description of a simple, effective hay press, which is doing useful work at the College. Mr. Potts writes:—

"The hay press represented in accompanying sketch is home made. The rollers (A) and wheels (B) are made from well-seasoned round



A HOME-MADE HAY PRESS AT THE QUEENSLAND AGRICULTURAL COLLEGE.

posts. The bed is made of five 5 in. by 4 in. hardwood beams set on two 8 in. by 4 in. hardwood crosspieces. The uprights start at 8 in. by 4 in., and at a height of about 2 ft. are reduced to 5 in. by 4 in. Each upright is stayed in two directions with iron stays attached to the bed. At the top, 5 in. by 4 in. crosspieces hold the uprights, while above these are three members running the length of the press; the two outside pieces are 3 in. by 2 in., the centre piece 8 in. by 4 in. The latter is slotted at either end, and carries two 6 in. pulley wheels. The winding rollers (A) are set about 16 in. above the bed, and each has a ratchet wheel at one end. The rollers have two square holes through them set



at right angles and near the centre; these are for the insertion of spokes for winding up the chains. A short distance above the rollers are 1 in. iron bars holding the uprights rigid and preventing the rollers from jumping out of their bearings. This bar also carries ratchet paul. The floating top is composed of three members, 5 in. by 4 in., held together with two 4 in. by 2 in. crosspieces. The outside 5 in. by 4 in. are attached to the crosspieces by bolts which work in slots, so that the width of the floating top can be adjusted. From each end of the centre member of the floating top a chain passes over the pulleys and back to the rollers (A). This enables the top to be raised, and it can be held in any desired position by means of the ratchet wheels. The length of the bales is controlled by nailing chocks across the bed and the under side of the floating top. These chocks hold in position 3 in. by 2 in. uprights, which fit between the beams of the floating top, and so do not interfere with its movement up and down. Having adjusted the size of the bales, the floating top is raised, the required amount of hay put in, then the floating top is released and settles on the hay. To develop the

pressure, four chains are attached to the ends of the outside members of the floating top. These are now attached to the rollers by hooking on to pins which are driven into the roller near each end. The pressure chains are wound round the roller in the opposite direction to the central lifting chain, so that on using the winding spokes the lifting chain is unwound as the pressure chains are wound up. It only remains to wire the bales and trim them. I trust this explanation will be clear enough; if not, it might be possible to take a run up to the College and see the actual press.

[In the issue of the *Queensland Agricultural Journal* for February, 1903, we illustrated and described the construction and operation of a rough home-made press, which did its work very well in the early days of farming in Queensland. A comparison between this and the College press is interesting as showing under what different conditions the present-day farmer works, who has the advantage of scientific advice.—Ed., "Q.A.J."]

NEW METHOD OF COMBATING PHYLLOXERA.

Widespread invasion of phylloxera in Spain, with consequent loss of productive value of vineyards, moved the Government to favourable action on the proposal to lower the tax value of land affected. A royal order of 22nd July, 1915, outlines the procedure to be taken by property owners who desire to benefit therefrom.

Apropos of the phylloxera situation and efforts to eradicate it, a Valencia trade paper quotes the Italian daily, "Il Popolo Romano," to the effect that experiments now under way in the Province of Lecce, Italy, may result in a practical and efficacious method of combating the disease. It appears from the article in question that a farmer planted tomatoes between the vines in an infected field, in the hope of deriving a larger income than the constantly decreasing grape crop would produce. A short time thereafter, as the tomato plants developed, he observed with surprise that the vines took on new life, showing signs of vigour such as they had not shown in years.

Not knowing the cause of the phenomena, but being of an investigating turn of mind, the farmer uprooted several tomato plants, on whose roots he found thousands of dead insects. This led to further investigations by a committee of experts, which is now going on. The scientific explanation is that tomatoes, belonging to the "Solanaceæ" family, contain the poisonous alkaloid solanine, which destroys the insect which preys on the vine.

The Valencia paper referred to recommends a trial by Valencia farmers, especially since it can be done without much trouble or expense. —Commerce Reports.

Pastoral.

MUNRO HULL CATTLE TICK REMEDY.

The Select Committee appointed by the Government included Mr. Walker, Mr. A. J. Jones, Mr. Larcombe, Mr. Bayley, and Mr. W. N. Gillies, Chairman, Members of the Legislative Assembly.

REPORT.

The Select Committee, appointed on the 6th October to inquire into and report upon the alleged discovery by Mr. G. W. Munro Hull of a Remedy for Cattle Tick, and the charges made by him against certain officials of the Agriculture and Stock Department of Queensland, beg to report as follows:—

1. That the Committee have examined the following witnesses:—G. W. M. Hull, C. J. Pound, E. G. E. Scriven, St. G. Thorn, H. B. Watson, W. C. Carmody, A. K. Henderson, H. Tryon, A. H. Cory, T. H. Johnston, B. H. Corser, W. A. A. Bates, A. J. Jones, and have carefully considered their evidence.

2. That the Committee have had before them the Departmental Papers, including the whole of the correspondence between Mr. Hull and the Agriculture and Stock Department of Queensland.

3. That in carrying out this inquiry the paramount consideration on the part of the Committee has been to ascertain the merits of Mr. Hull's claim to have found a remedy for Cattle Tick, and whether further investigations and experiments are warranted.

4. That, regarding charges made by Mr. Hull against officials of the Department, the Committee find there has been, generally speaking, a lack of sympathy, a spirit of scepticism, and a failure to grasp the possible national importance of such a discovery; that there was a manifest desire to disprove, rather than a whole-souled desire to co-operate and assist in a thorough and impartial investigation; and for this the Government of the time must be held responsible.

5. That, in spite of the fact that the evidence tendered has proved conflicting and indeed contradictory, the Committee are of the opinion that it certainly warrants the Government proceeding further in regard to the matter.

RECOMMENDATIONS.

6. The Committee recommend that further investigations and experiments should be carried out on practical and scientific lines.

7. That the following gentlemen be appointed by the Government as a Committee to supervise and direct such investigations and experiments:—Mr. Tryon (Government Entomologist), Mr. Pound (Government Bacteriologist), Mr. Cory (Government Veterinary Surgeon), Dr. Johnston (Queensland University), Professor Steele (Queensland University), and another person to be nominated by Mr. Hull.

The first meeting of the Committee was held at the Department of Agriculture and Stock on the 15th February, 1916.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF JANUARY, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Melba	Holstein	17 Dec. 1915	1,260	3·8	56·15	
Madam Melba	"	28 Oct. "	879	3·9	40·23	
Lady Margaret	Ayrshire	14 Oct. "	693	4·5	36·72	
Violette's Peer's Girl	Jersey	8 Dec. "	628	4·9	36·31	
Miss Melba	Holstein	30 Sept. "	726	3·9	33·22	
Sweet Meadows	Jersey	28 Sept. "	496	6·0	30·77	
La Hurette Hope	"	17 Nov. "	570	4·5	30·21	
Twylish's Maid	"	22 Oct. "	489	5·2	30·03	
Dottie ...	Shorthorn ...	27 Nov. "	493	4·5	26·12	
Miss Edition	Jersey	27 Sept. "	459	4·8	25·95	
Daisy ...	Holstein	23 Nov. "	614	3·6	25·89	
Gretchen ...	"	16 Aug. "	597	3·7	25·88	
Rosebud II.	Ayrshire	11 Oct. "	547	4·0	25·68	
Bluebelle ...	Jersey	20 June "	462	4·7	25·59	
Laurette II.	Ayrshire	9 Oct. "	550	3·9	25·17	
Noble Dot ...	Jersey	2 May "	399	5·3	24·98	
Miss Jean ...	Ayrshire	5 Nov. "	542	3·9	24·80	
Sylvia ..	Shorthorn.. ...	25 Aug. "	491	4·2	24·22	
Lady Twylish	Jersey	5 June "	394	5·2	24·19	
Constancy ...	Ayrshire	24 Nov. "	462	4·3	23·37	
Special Edition	Jersey	1 Nov. "	433	4·5	22·94	
Miss Bell ...	"	2 July "	358	5·4	22·83	
Miss Lark ...	Ayrshire	8 Sept. "	476	4·0	22·35	
Jeannie ...	"	1 Nov. "	497	3·8	22·13	
Rosine ...	"	7 Aug. "	481	3·7	20·84	
Windyhill Davidina	"	21 Aug. "	453	3·9	20·72	
Lilia ...	"	19 Aug. "	464	3·7	20·14	

In addition to the rough feed available in the paddocks, each cow received a daily ration composed of 12 lb. oaten chaff, 8 lb. lucerne chaff, and 4 lb. bran.

PLANTING COW-PEAS WITH MAIZE.

For seed purposes the cowpea thrives best when sown by itself where it can receive plenty of sunlight. To grow it between rows of corn will reduce the progress and capacity of the plant to yield a good crop, unless, of course, the corn is thinly planted. If it is a question of growing fodder, then, certain varieties of cowpeas can be sown simultaneously with the maize, or after the first cultivation is given to the corn.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1916.

Six thousand three hundred and sixty eggs were laid during the month, an average of 120 per pen. Taking into consideration the time of year, the fact that a number of birds were in moult, and that no green food was available, the return may be looked upon as a good one. We used scalded lucerne chaff with the pollard and bran, but, as pointed out before, this is a very poor substitute for green feed. J. D. Nicholson wins the monthly prize with 143 eggs. Throughout January there were only five birds in Mr. J. R. Johnston's pen of Plymouth Rocks. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
C. B. Bertelsmeier, S.A.	White Leghorns ...	131	1,306
J. D. Nicholson, N.S.W.	Do.	143	1,283
A. H. Padman, S.A.	Do.	136	1,271
Mrs. Munro	Do.	124	1,270
J. Gosley	Do.	120	1,255
J. R. Wilson	Do.	129	1,248
E. F. Dennis	Do.	122	1,243
A. W. Bailey	Do.	125	1,241
Jas. McKay	Do.	102	1,239
J. M. Manson	Do.	140	1,238
J. M. Manson	Black Orpingtons ...	117	1,235
King and Watson, N.S.W.	White Leghorns ...	132	1,213
Kelvin Poultry Farm	Do.	122	1,212
W. Parker	Do.	138	1,199
A. T. Coomber	Do.	125	1,198
O.K. Poultry Yards	Do.	120	1,197
Mrs. J. Jobling, N.S.W.	Black Orpingtons ...	106	1,187
T. Fanning	White Leghorns ...	139	1,185
E. A. Smith	Do.	119	1,183
H. Hammill, N.S.W.	Do.	139	1,183
C. Knoblauch	Do.	127	1,183
W. Purvis, S.A.	Do.	127	1,170
T. Fanning	Black Orpingtons ...	115	1,167
C. T. Clark	White Leghorns ...	108	1,164
E. V. Bennett, S.A.	Do.	120	1,163
Cowan Bros., N.S.W.	Do.	135	1,162
S. E. Sharpe	Do.	97	1,160
Moritz Bros., S.A.	Do.	139	1,154
R. Burns	Black Orpingtons ...	120	1,150
E. A. Smith	Do.	126	1,137
F. Clayton, N.S.W.	White Leghorns ...	110	1,135
W. Lindus, N.S.W.	Do.	122	1,130
E. Le Breton	Do.	106	1,124
J. H. Gill, Victoria	Do.	139	1,109
R. Burns	S. L. Wyandottes ...	116	1,107
Derrylin Poultry Farm	White Leghorns ...	124	1,106
W. Meneely	Black Orpingtons ...	113	1,101
Geo. Tomlinson	White Leghorns ...	110	1,100
R. Jobling, N.S.W.	Do.	114	1,098
Cowan Bros., N.S.W.	Black Orpingtons ...	115	1,087

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
W. Lyell ...	White Leghorns ...	120	1,080
J. G. Richter ...	Do.	108	1,079
Loloma Poultry Farm, N.S.W. ...	Rhode Island Reds ...	121	1,058
J. Zahl ...	White Leghorns (No. 1)	101	1,054
G. H. Turner ...	White Leghorns ...	107	1,038
J. Aitcheson ...	Do.	102	1,037
R. Jobling, N.S.W. ...	S. L. Wyandottes ...	100	1,031
J. Zahl ...	White Leghorns No. 2	105	1,020
S. Chapman ...	Brown Leghorns... ...	136	1,004
E. Pocock ...	White Leghorns ...	100	996
W. H. Forsyth, N.S.W. ...	Do.	130	970
F. Clayton, N.S.W. ...	Rhode Island Reds ...	125	964
J. R. Johnstone ...	Plymouth Rocks ...	93	757
Totals ...	...	6,360	60,379

PRESERVING EGGS.

At this time of the year a certain, sure plan to preserve eggs is almost invaluable. There are many plans adopted by poultry keepers, but I am pretty confident the most simple plan is the most successful; particularly when, as is generally the case, it is only for two or three months' keeping. The main, and most pertinent, point is to close the pores of the shell, which can be most easily done by rubbing well over by butter, oil, lard, or dripping. The best way is to render down some lard in a basin, dip the eggs one by one into it. Do not make the mistake that has so often been done by having the liquid lard, oil, butter, or dripping hot, but just warm enough to melt those substances so that the eggs can be dipped into it. Then the greasy substances must be well rubbed into the pores of the shell with the fingers. After these operations have been faithfully performed, the eggs can be stored in bran in the store tub, or packed in a barrel in hay, if it is purposed to send them away. If the eggs are stored in bran, they must be tended from time to time to prevent the bran becoming damp or mouldy, which would utterly spoil them.

Another good way to preserve eggs would be to take, say, a couple of hot lime shells, place them in an earthen basin, slake them with a good quantity of water, stirring it all the time so as to allow the sediment to fall to the bottom. Place this mixture aside for some hours, and when the water has risen to the top, pour it off, leaving only the thick creamy soft lime, and there you have the material which, when hardened round the packed eggs, preserves them most effectually for some months at a stretch. Then take the eggs and place them in any suitable vessel (chipped or cracked milk dishes would answer the purpose admirably); then put them in a layer all straight on end, and with a spoon fill up with the lime until the eggs are more than covered. Then put in another layer, and proceed as before until the dish is filled up. After filling the dish, place it in a cool place, but which should not be too dry—a floor of a cellar would be excellent for the purpose. When these

eggs are required for use, pick them over carefully, first taking them out of the lime, with the point of a knife or a sharp spoon.

The great secret of preserving eggs fresh without recourse to more elaborate processes is to place the egg small end downwards, and keep it in that position. This should always be the position of an egg whether kept for sitting or for use, rubbed with grease, or preserved in lime or chemical preparations. An inch board about a foot wide, and from two to three feet in length should be procured, and holes bored in it an inch and a-half in diameter. Strips of board or lath might then be nailed round this board as a ledge, and a cupboard in a cool place fitted up with five or six inch boards or shelves. Then, as fast as you get fresh eggs, place them in the holes in the boards, small ends downwards, and they will thus keep fresh for some weeks. These shelves might be substituted for boxes. A carpenter should make boards of this description for a very small sum, but if you are any way handy with tools, as so many poultry keepers are, you make them yourself.

Eggs can be preserved by being brushed all over with a solution of gum arabic, and then packed in dry charcoal dust—also by being kept in the following mixture, which was invented by a Sheffield, England, poultryman, thus:—"In a tub place a bushel of quicklime, two pounds of salt, half-a-pound of cream of tartar, and mix all together with sufficient water to make the composition of such a consistency that an egg put into it will swim to the top just above the fluid—then put in the eggs, which, it is said, will keep good for two years.—Exchange.

The Horse.

STATE HORSE BREEDING.

At the Newmarket (London) sales lately the mare Tresanta was sold to go to Australia. The total lots sold numbered 497, and their value 84,200 guineas. About 100 lots were bought for Australia.

The Government has acquired Colonel Hall Walker's training stables at Rushley Park, and Colonel Hall Walker thereon presented to the Government all the horses in the Tully stud and at Rushley Park suitable as stallions.

The London "Daily Telegraph" says that by accepting Colonel Hall Walker's offer the Government has pledged itself to embark upon some scheme of State horsebreeding. The vital importance of the gift lies in the fact that the possession of Tully and Rushley will be some sort of insurance against an absolute dearth of horses for war purposes. There is now an absolute lack of suitable light horses. The time will come when the Government will have their own thoroughbred stallions and be likely to get three-quarter and half-bred stock of the desired type. War demands have doubtless largely depleted the horses of Canada and Australia. The Government from its studs will be able to supply the Colonial Governments with horses and improve and stimulate the breeding thereof.

The Orchard.

A FINE MANGO.

We have received from Mr. Swayne, M.L.A., a very fine specimen of a mango, which is identified by Mr. A. H. Benson, Director of Fruit

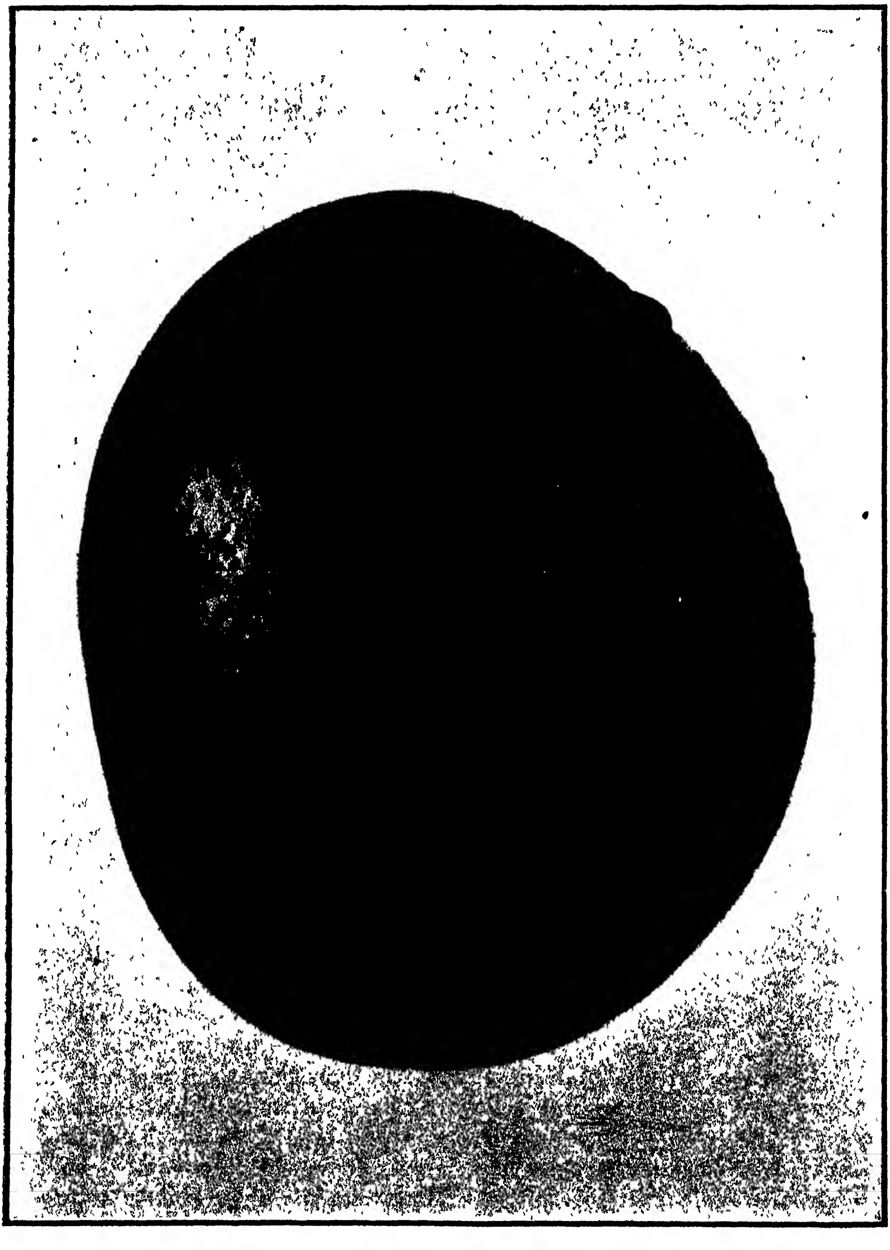


PLATE 10.—THE "GOPAL BAUGH" MANGO, GROWN AT AUCHENFLOWER BY MR. JEFFS.

Culture, as being probably the Indian "Gopal Baugh." This mango was grown by Mr. Jeffs, of Auchenflower. Two of them weighed 3 lb. 4 oz., and the fruit here depicted weighed 1 lb. 9 oz. In colour it is of a yellow tinge when ripe, and is more round than of the usual oval type. The flesh is firm, light in colour, and of a most exquisite peach-like flavour, differing considerably from that of most mangoes grown in the State. The sub-acid juice gives an additional charm to the flavour of this fine fruit. The stone or seed is of considerable size, but there is no sign of fibre whatever. Such an exquisite fruit should find a good market here, and also in the Southern market, as the firmness of the flesh even when just ripe indicates that it would prove a good carrier.

REPORT ON INVESTIGATION OF BITTER PIT.

A number of copies of Professor D. McAlpine's fourth Report on the investigation of bitter pit are in the possession of this Department, and those fruitgrowers interested in apple culture can obtain a copy of the same by application to the Under Secretary. The matter is of especial interest to the fruitgrowers of the Stanthorpe district and other parts of the State where apples and pears are grown commercially.

AGRICULTURAL LABOUR.

The difficulties of obtaining an adequate and suitable supply of labour, both skilled and unskilled, just at the moment when it is most required constantly face the agricultural community, and these have not been overlooked by the Government in its efforts to assist the primary producers. The Department of Labour has been reorganised, and practically remodelled, with a view to affording every facility to employers and employees to make known their requirements and to bring them into touch with one another. The system provides for a constant interchange of information respecting the labour market between all central exchanges, so that surplus labour may be rapidly transported from one district to another in which a demand exists. Our readers' attention is drawn to an advertisement appearing in this issue which amplifies the above and describes the advantages to be derived from the use of the Department's agencies, not the least of which is the fact that no charge is made to either the employers or employees for the services of the exchanges. A new feature, adapted from the New South Wales system, is the placing of post-free letter cards at all post offices throughout the State, on which the employer may, without cost, notify the nearest central exchange of his wants, and similarly the unemployed worker may register his name as an applicant for employment.

The women's registry office, which has recently been opened in Adelaide street, and at which domestic labour, and, in fact, female labour of all classes, may be engaged, has already proved its usefulness, and the volume of business being transacted at this branch of the department is increasing daily. The concession granted by the Government of rail fares at half-rates to all employees engaged at the Government exchanges, is another inducement to both employers and employees to patronise the exchanges to the fullest extent.

Horticulture.

JADOO FIBRE.—No. 2.

In the issue of this journal for December, 1899, Mr. J. C. Brünnich, Agricultural Chemist of the Department of Agriculture and Stock, gave an analysis of the Jadoo fibre. In his report thereon he said:—

" Several articles have appeared in this journal on Jadoo fibre, an artificial fertilising product, which, so far, has hardly received in this colony the attention it seemingly deserves.

"The Department of Agriculture supplied a quantity of Jadoo fibre to the Agricultural College for experimental purposes, and the results of these experiments will be looked for with interest, although in our rich College soils the effects might not be so marked as in poorer soil.

"In order to see if what the inventor claims is really true, I made a complete analysis of the product, with the following result:—

"I found Jadoo fibre to be a fine fibrous product, of brownish colour, which, almost like a sponge, has the power of absorbing an enormous quantity of water, up to six to eight times its own weight. This fact alone will explain part of its practical value, when used for pot plants, in the orchard or vineyard. This fibrous raw material is saturated with plant foods, which, according to analysis, are to a large extent soluble in water, any plant having thus a fair amount of plant foods at once available for its growth; other portions of the plant foods, are, like some in the soil, not soluble in water, but soluble in hydrochloric acid, and these will become available gradually by the chemical dissolving action possessed by the roots of growing plants. As a matter of fact, Jadoo fibre must be considered a highly fertile artificial peaty soil.

Analysis.

	Per cent.
Organic matters	71·40

Containing ·812 per cent. of Nitrogen=·986 per cent. Ammonia.

Mineral matters—

Soluble in water (total, 4·36 per cent.)

	Per cent.
Phosphoric acid, P_2O_5	·445
Sulphuric acid, SO_3	1·286
Nitric acid, N_2O_5	·520
Alumina and iron, Al_2O_3, Fe_2O_3	·271
Lime, CaO	·303
Magnesia, MgO	·107
Potash, K_2O	·357
Soda, Na_2O	·750
Ammonia, NH_3	·020

Soluble in hydrochloric acid, 1·1 sp. gr.

	Per cent.	
Silica, SiO_2	·031	
Sulphuric acid, SO_3	·926	
Phosphoric acid, P_2O_5	·715	
Alumina, Al_2O_3	·765	
Iron, Fe_2O_3	·170	
Lime, CaO	1·875	
Magnesia, MgO	·163	
Potash, K_2O	·402	
Soda, Na_2O	·791	
	5·838	
Insoluble in HCl	4·012	
Total ash		9·85
Moisture		18·75

"The inventor does not claim the product to be a manure, and in accordance with the analysis, the actual value of the plant foods, phosphoric acid, potash, and nitrogen amounts to 15s. per ton of Jadoo fibre. The secret of the preparation lies in the foundation material, which has the power of absorbing and retaining the fertilising ingredients, which are thoroughly incorporated with the fibre by a slow process of fermentation.

"I believe the manufacture of this product could be successfully started in this State, and I do not think that a better foundation material could be found than finely crushed megass from a sugar-mill. Megass by itself has only a slight manurial value (about 6s. per ton), but it possesses great absorptive power, and retains water just as well as Jadoo fibre; and, again, does not rot quickly in the ground. Perhaps finely chopped trash, or, again, dried filter press cake, might be added with advantage to the megass."

In connection with this foundation peat moss, we may mention that the writer, accompanied by Captain Pennefather, Comptroller of Prisons, made an examination of some peat moss on Mud Island. When this material was cleaned and dried, a sample was sent to Mr. Virgoe, in Melbourne, who, after a trial, pronounced it to be a very good foundation material. There is any quantity of it on Mud Island, close to the highland on which a huge fig-tree is growing.

JADOO FIBRE—HOW TO USE IT.

Since Jadoo fibre was introduced into Australia in 1896 by Mr. W. R. Virgoe, as agent for the Jadoo Company in England, many people have tried it, and report very favourably on its qualities as a plant food. All, however, do not possess the knowledge of how to use it. Some, indeed, have thrown away the fibre after a season, under the impression that it was used up. As a matter of fact, it can be used many times over; in fact, it has not been ascertained yet when it becomes exhausted. Colonel Halford Thompson, chairman of the

company, in a letter to the "Tropical Agriculturist," Colombo, says:—"It has proved practically *impossible* to wash out the properties of Jadoo fibre, even when exposed to tropical rain."

Preparation for Use.—Jadoo fibre is exported in bales containing six bushels in each, hydraulically compressed into a space of 5 cubic feet. In a fresh state, as it leaves the factory, a bale weighs 2 cwt., but owing to evaporation of moisture, on its arrival here in summer, or after being here some time, the weight is considerably reduced, though the substance is there all the same; hence it is always sold by measure.

Before using, the fibre must be thoroughly disintegrated. This can be done in various ways; the simplest being either to use an ordinary washwoman's board and rub the fibre on it, placing the board on a slant in a box or case as a washwoman would do in a tub; or a piece of the wire netting with which the bale is encased may be tacked on to a flat board and used in the same way. Small quantities may be rubbed between the hands.

Before using in the open ground for trees, plants, vines, &c., or for potting plants, the fibre should be moistened with water, if at all dry, until a bushel weighs about 35 lb.; but if only for seed sowing it may be watered as directed under "Sowing seeds."

It is advisable to prepare only such quantity as is required for immediate use, so as not to unnecessarily promote evaporation of moisture.

Potting Plants in Jadoo.—Always use pots two sizes smaller than required for soil; then proceed exactly as with soil, but pot much more firmly in all cases. If Jadoo and soil are used together, then a pot *one* size smaller than that for soil may be used, and the firmness of potting modified accordingly. Some plants require loose potting in soils; pot these a little firmer in Jadoo. Some, again, such as palms, require very firm potting; use extra firmness with Jadoo; then, again, the firmness of potting should be modified by the quantity of soil mixed with the Jadoo. When watering, do it thoroughly. Don't water merely because the surface seems dry. No hard-and-fast rule can be laid down—discretion must be used. Mr. W. Wallace Lunt, a celebrated horticulturist, who has had wonderful successes with Jadoo, may be here quoted. He writes:—"In conclusion, let everyone who has brains grow his plants in Jadoo, but if he intends growing on the 'hit-or-miss' plan let it alone."

Sowing Seeds.—Crock the pans or pots as usual, putting some of the rougher portions of the Jadoo over the crocks. Fill up with the fibre and press evenly down, and water thoroughly; then sow the seed thinly and cover to about its own depth, add a little silver sand, and again press all firmly and smoothly. Be careful not to over-water afterwards. If Jadoo and soil are used, mix thoroughly before use. The above applies to the larger kinds of seeds, from the size of a small pea upwards. For fine seeds—

First sift a small quantity of Jadoo with a sieve, say ⅛-inch mesh (or smaller according to size of seed). Then proceed as above, but, before sowing, water well and let the pan stand for awhile; then sprinkle about an eighth or a quarter of an inch of the fine Jadoo over the surface, and sow the seed thinly, and sprinkle a little more fine Jadoo and silver sand to cover it (if required), and press all evenly down (the bottom of a pannikin or similar article effects this purpose well). Very fine seeds, such as lobelia, &c., require no covering.

After once watering, or if Jadoo is used in a sufficiently moist state, more water is seldom required till the seeds germinate. Should the surface appear very dry at any time, a slight sprinkle with a fine syringe is sufficient.

Vines.—For Old Vines: Scrape away the earth as near the principal roots as possible; place the Jadoo about 6 inches below the surface, covering up with earth again. The object is to cause fresh fibrous roots to form in the Jadoo. It is specially important that the Jadoo be used moist. For striking vines, the eye, or cutting, should be started in a bed of Jadoo fibre. In planting out young vines put a gallon of Jadoo fibre above and also below the roots. Jadoo liquid diluted 20 to 1 will be found to help on the crop greatly, given when vines are first breaking, and when the fruit begins to colour.

Fig-trees.—Scrape away earth for 6 inches deep in a circle round the stem, varying in diameter with the size of the tree, dividing the earth taken out into two parts; mix an equal quantity of Jadoo with one of them, replacing it next the roots, then put the other half on the top next the surface. The actual quantity of Jadoo used must depend on the size of the tree.

Peach-trees.—Scrape away the earth and put in a bushel of Jadoo to each tree, as close to the roots as possible, replacing earth above it. In planting young peach-trees put a peck (quarter bushel) of Jadoo in with the tree, part below, part above the roots.

Vegetables.—Put about an inch of Jadoo in the furrow in which you sow the seed. This will greatly accelerate germination, and thereby bring crop to maturity at least a fortnight sooner. It also makes healthier and stronger plants.

Chrysanthemums.—Put the cuttings in two-thirds Jadoo, one-third loam with a sprinkling of sand; afterwards use half Jadoo, half loam, until final shift, when the Jadoo may be reduced or increased as experience dictates.

For chrysanthemums grown in earth Jadoo liquid will be found an excellent mode of feeding, diluted in 48 to 1 at first, and gradually increased to 20 to 1. Plants grown entirely in Jadoo fibre do not want this unless very large flowers are required.

Potatoes.—Early potatoes should be placed in the furrow so that they lie in about 2 inches of Jadoo. This will accelerate the maturing of the crop considerably.

Twenty-five tons to the acre of marketable tubers have been grown in poor soil by this method.

TO RENOVATE JADOO FIBRE.

Jadoo can be used many times over; in fact, it has not yet been ascertained when it becomes exhausted. This is a great point in its favour, and tends materially to reduce its original cost. The writer has raised six pans of seedlings in one year with the same lot of Jadoo, adding a little, of course, to make up for what adhered to the plants in pricking out from the pan, the method adopted being thus:—As soon as the young seedlings were pricked off the fibre was spread out in a box, and exposed to the air for a few days to sweeten; it was then watered with Jadoo liquid at a strength of 1 to 20 of water, until sufficient moisture had been absorbed to restore it to its original weight (about 35 lb. per bushel), and then used as at first.

With Jadoo remember these points:—

Thoroughly disintegrate the fibre, leaving no lumps.
Use in a moist state.
Pot firmly.
Don't over-water.

Jadoo Liquid.

Jadoo liquid is a highly concentrated solution of the elements which enter into Jadoo fibre, the proportion of these elements being slightly changed. It is used diluted in water in the proportion of 1 part Jadoo liquid to 20 to 48 parts water, according to circumstances. Its composition never varies, thus avoiding all possibility of mistakes in its use. Jadoo liquid revives drooping plants, strengthens the weak, and nourishes the strong. Above all, it increases the size, causes greater profusion of bloom, and heightens the colour of all flowers.

THE SUGAR SEASON OF 1915.

In the middle of the season, Mr. Easterby, General Superintendent of the Bureau of Experiment Stations, estimated the probable cane crop at 1,230,000 tons, and the yield of sugar at 136,000 tons, reckoning 9 tons of cane per ton of sugar. How nearly this estimate was correct is shown by the returns of the Government Statistician, who shows that the yield of sugar was 143,427 tons, which is considerably higher than was hoped for when Mr. Easterby made his estimate in the middle of the season. Yet the two estimates of the tonnage of cane harvested were almost identical. "The larger output of sugar (says the 'Sugar Journal') is due to the superior quality of the cane this year in most districts. This means, taking the Queensland crop as a whole, that 1 ton of sugar has been produced from just about 8 tons of cane, which is a better yield than has been recorded for any previous year."

Forestry.

FOREST CONSERVATION.

The subject of the preservation of our timber supplies has been brought under the notice of the rural public for many years, yet the destruction of many valuable timber trees is carried on daily, without the slightest individual or co-operative attempt to supply the drain. Why should people always look to the State to do this work for them? When a settler begins to plant an orchard, he does not ask the Government to supply him with trees at the public expense; he purchases his own trees, plants them at his own expense, and spends his private means on carefully tending them until they finally begin to repay him for his outlay. If a tree dies or becomes weak from too heavy bearing, he roots it out. Does he leave a blank in the orchard? He knows better than that. He at once plants another in its place, which in due time will repay the care bestowed upon it. As other trees fail or die from various causes, the gaps are regularly filled up, and so the orchard goes on year after year with no diminution either in numbers or in yield.

Is it so with our forest and scrub trees? When cedars, beeches, and pine trees are cut down, does the timber-getter, even if he be the owner of the land, ever think of planting others in their places? Never. Then comes the question, "Why not?"

Perhaps the answer of one man may serve for that of all owners of heavily timbered land.

That man was in treaty for the purchase of a large property not 50 miles from Brisbane, and one inducement held out to him was that the timber on the land was worth at least £500.

"Oh! bother the timber," was his reply. "I want it cleared off to grow stuff for the stock." *E uno disce omnes.* So says the Latin writer, and it is equally true of our planters, farmers, and selectors. The case of one is the case of all. Get rid of the timber. There is enough to last their day; and as for posterity, well, let posterity look after its own timber supplies. What many fail to understand is, that a well-managed timber estate is worth more than a poorly managed farm or orchard.

For the sake of comparison, let us take a rich rubber-tree forest, such as are to be found in Brazil, in Central America, and other countries of the world. The old trees are there. They are constantly reproducing themselves. When the old trees die or are killed off by excessive tapping, there are constant supplies of young trees coming on, hence the supply of rubber is practically inexhaustible. No man would be insane enough to clear off the rubber-tree producing jungles for the purpose of growing corn for cow feed.

A fifteen-year old *Hevea Braziliensis* will yield nearly 5 to 6 lb. of rubber per annum, valued at 3s. 6d. to 4s. per lb. An acre containing 100 of these trees is therefore worth £100 to £120. All the time during which the old trees are being tapped the younger trees are coming on, and are ready to take the place of those that are worn out or dead.

An acre of land planted with citrus fruits contains, say, 100 trees. The gross annual value of the produce of these trees may be averaged at £100, some producing as much as £5, others only 5s. From this has to be deducted the cost of cultivation, pruning, dressing, spraying, fumigating, picking, packing in cases, &c.—expenses which vary with the soil, climate, locality, proximity to market, &c.

Now take the case of bananas, which produce more food matter than any known product of the soil, acre for acre. It is estimated that 100 acres of good land established in bananas will yield during the second and subsequent years after planting about 1,000 bunches per week. Each bunch will contain, according to the variety, from seven to ten hands—a hand consisting of from ten to seventeen bananas; each bunch would thus be worth about from 2s. to 2s. 4d., bringing the yield of an acre up to over 9s. per week, or over £40 to £50 per acre per annum. Jamaica bananas sell in the London market at from 12s. to 15s. 6d. per bunch, whilst at Glasgow some were sold as high as 14s. to 16s. per bunch.

We have now compared three crops—rubber, citrus fruits, and bananas. The first requires no cultivation; the second stands in need of constant care and attention, involving considerable expense from the very outset. The third can pretty well look after itself, once the stools are established.

What I more particularly want to point out is the pressing need for caring for the perpetuation of forest and scrub trees, hard and soft.

In all our yet standing scrubs, the timber-getter is busy removing the various commercial timbers peculiar to the scrubs, amongst which the principal are kauri pine, hoop pine, cedar, beech, crows' ash, and silky oak. When these are gone, then, according to popular opinion, nothing is left of any commercial value, and the scrub is only fit to be cut down and burnt off. But there are still many timber trees in the coast scrubs especially which will yet be of great commercial value for the purpose of furniture-making, veneering, &c. Such are the yellow-woods, rosewood, tulip-wood, brigalow, satin-wood, and many others, all of which are capable of taking a high polish, and of making excellent veneers, and these should be preserved as much as those in more immediate demand.

This does not imply that no scrub should be cleared, or that the more valuable timbers should not be brought to market. Timber we must have, and forests were intended by Providence to be cut down for the use of man, and for other purposes besides, such as attracting rain, preserving the land from being dried up by exposure to the scorching rays of the sun, and protecting the soil from being washed

down into the watercourses. But what is required is the protection and nursing of the young trees which, in the ordinary course of nature, would eventually take the place of those removed.

Planting young trees is not so much a necessity as the nurture of those growing naturally. To this end all that is needed is for the timber on our lands already reserved by the Government for forest areas, to be carefully tended.

In France the work of restoring the forest is being systematically carried on, and in mountainous country, ages since denuded of timber, the course of torrents is stopped or deflected by means of stonework and fascines made of live willow. These fascines readily strike root, and form a barrier behind which the débris from the high lands accumulate, and so by degrees the wasting of the surface is arrested and forest planting begins. It must be borne in mind that the re-afforestation of a denuded hillside, cut into deep chasms by the descending torrents, extends its influence to the plains below, often for hundreds of miles.

The silt washed down from the bare hills is carried on to the low lands, and instances can be multiplied in every country of the world, where civilised man has planted his foot, of tens of thousands of acres of rich alluvial plains being overwhelmed with barren gravel, sour mud, and other silt. Witness the ruin of many farms in Southern Queensland after the great flood of 1893. Not only were many acres completely washed away, but entire farms were for miles covered with a sour deposit several inches thick, which rendered the land utterly unfertile, and caused the owners to abandon them in despair.

In Germany the forests are so skilfully managed that 11,000,000 acres of State forests produce an annual income of £4,000,000. And this result is arrived at, not so much by planting as by intelligent work in regenerating the forests. The German forester works on opposite lines to those of the lumberer. He arrives at his happy result by a process of natural selection—he gets rid of the least valuable timber in various ways, and causes the survival of the fittest by judicious culling. The lumberer destroys the fittest and leaves the most useless to cumber the ground.

The Khanate Bucharia was once upon a time the most flourishing and fertile region of Central Asia. It was well timbered and well watered. What has happened to this earthly paradise is happening now in our midst. A mania for clearing seized the inhabitants within the last thirty years. All the great forests have been destroyed, and what was spared was swept out of existence by fire during the civil war. Now mark the consequence. With the disappearance of the forests, the watercourses gradually dried up; there was no water left to feed the empty irrigation canals. The great barrier against the desert sands was removed, and irresistibly they advanced upon and gained daily on the fertile plains; and it is now only a question of a short time when this magnificent region will become a desert as desolate as the solitudes that separate it from Khiva.

Dr. D. Morris, C.M.G., M.A., &c., &c., in his report on the "Economic Resources of the West Indies," in alluding to the forests of British Guiana, says:—"The total export of timber is £16,000 per annum. The forest lands yield a yearly revenue of about £48,000, made up of "acre money," royalty on timber shingles, charcoal, balata (the milky juice of the bullet-tree (*Mimusops globosa*), a kind of guttapercha), and gums. These forests, rightly controlled, should constitute an important source of wealth to the colony. Owing to the difficulty of reaching the region above the falls [presumably of the Essequibo River—A.J.B.] the forests below have been cut over several times and the best timber removed. In some localities firewood-cutters and charcoal-burners are destroying valuable timber and preventing the growth of young saplings.

The Guiana forests are the most valuable of any in the West Indian colonies. Hitherto they have only been partially protected, and it is evident that they are in danger—at least, in the most accessible districts—of being seriously injured. The vast regions above the falls are safe only from their inaccessibility. If suitable means of reaching them could be devised, and the cutting carried on under proper regulations, they would be capable of supplying valuable timber and contribute largely to the wealth of the colony. The most valuable timber is the "greenheart," known also as the "bibiru" (*Nectandra Rodiœi*). This tree (one of the laurels) is widely distributed on rocky soils along the banks of the Essequibo, Mazaruni, and Cuyuni Rivers, but not extending more than about 100 miles inland from the coast. The bark yields a valuable tonic medicine—biberia. The timber is very hard and durable, and is specially valuable in the construction of canals, wharves, dock-gates, and in shipbuilding. It withstands the attacks of the teredo, and lasts longer than any other timber under water.

According to Mr. McTurk, greenheart in British Guiana has been practically exhausted in the area below the falls, "but, above, there are millions of cubic feet that have never been touched by the axe." These are protected to the extent that those squaring less than 12 inches are not now allowed to be cut. The indiscriminate cutting of wood for charcoal-making is regarded as very injurious to the forests of the colony.

In Grenada, attention has been called to the serious effect of deforestation. The best timbers are everywhere being destroyed to convert into charcoal.

With all the knowledge we possess on the subject of forest conservancy, we still persist in the suicidal policy of extermination. Whence shall we obtain our supplies of the marvellously durable timber of the *Eucalypti*, once we have swept them from the face of the land? How many generations will come and go before such magnificent trees as we have seen even in the close neighbourhood of Brisbane can be reproduced? To depend on foreign countries for our supplies is to depend upon a broken reed. The vast forests of North America, Canada, Oregon, British Columbia, and Vancouver are being destroyed wholesale. There is nothing to take their place. The great forests of South America cannot furnish us with our requirements. But we have the means in

our own hands of keeping up our supplies for all time, and it is the duty of every citizen of the State to help in the work, and to do so before irreparable damage has been done.

A Parliamentary return in connection with the Woods and Forests Department of South Australia shows that for twenty years, so far back as 1876, the expenditure on natural forest management was £44,626 7s. 8d.; on establishing plantations, £55,451 19s. 5d.; on rearing and distributing trees gratis, £26,101 5s.; in experimental and ornamental planting, £9,160 7s. 11d.; total, £135,340. The revenue derived from natural forest management—rents and sales of timber, £117,904; from plantation timber, £1,000; valuation of existing plantations (6,751 acres), £120,000; value of 4,000,000 trees given away at 2d. per tree (exclusive of vines), £33,000. The balance in favour of the department was £136,564.

THE NEED OF REAFFORESTATION.

Many articles on this and other subjects connected with forestry have been published in previous numbers of the "Queensland Agricultural Journal," and much information contained in those articles has been the outcome of what has been done in the direction of the conservation, reproduction, and destruction of various timber trees, in many parts of the world, as well as in our own State. Our personal knowledge of the timber industry in Queensland goes back to the year 1861, when dense scrubs, rich in pine, yellow-wood, crow's ash, &c., clothed the banks of most of the rivers and creeks, and timber-getters and shingle-splitters located themselves therein, only a short distance from Brisbane. In the Logan and Albert districts large quantities of splendid cedar and beech were obtained, whilst hardwoods, such as ironbark, gum, bloodwood, &c., abounded. The extensive scrubs of the Blackall Range, holding a wealth of Moreton Bay and Kauri pine, had then not been exploited. If in little over fifty years our timber supplies have disappeared from many localities, what must be the inevitable result in another half-century, unless vigorous steps are taken in the direction of reafforestation? The subject is ably discussed in the following article by W. Swan, in the "New Zealand Farmer, Stock, and Station Journal," of January, 1916:—

Much has been written of late in regard to the above subject, dealing generally with the commercial point of view, viz., timber, and as we are all agreed on this matter, it is not my intention to deal with this particular line, but rather from a wider outlook—as it affects the climate and general conditions of a country. When dealing with probabilities of the future it is always advisable to look into the past, and from the evidence gained thereby a more sound argument can be obtained. Following on these lines the first question arises, "Has deforestation adversely affected a country?" One of the most notable examples in the affirmative is found in what is now known as the Great Sahara Desert. Historians state that at one time this was apparently a most fertile tract

of country, probably heavily wooded, and a long time since inhabited by the Phœnicians. At that period this nation was the most advanced and powerful race living, occupying the proud position similar to that held by the British to-day as the strongest marine power existent. Shipbuilding of iron being then unknown, the forests were denuded of their growth to supply the timber for the construction of ships both for the navy and the merchant service, till finally the country was practically cleared of arboreous growth. Then the climate gradually changed, rain became more and more intermittent, greater extremities of heat and cold were experienced, powerful gales swept the country, and, against overwhelming odds, the race passed out of existence, and the hitherto fertile country is to-day a vast barren region—rainless, exposed to terrific gales that tear up the sand, rendering life impossible, either animal or vegetable, and a temperature of such diversity that at midday it may well be over 100 degrees in the shade, whilst shortly after sunset down below freezing point.

Coming to more modern times, we may next take notice of an island to which frequent allusion has been made of late. I refer to St. Helena. This island is at present a bleak, barren spot, possessing a climate of considerable extremity, especially in heat, and suffering more or less by absence of rain a great part of the year, and during the wet intervals visited by tropical rains of great severity. At one time, probably in the early part of the seventeenth century, it is known that this island was heavily wooded, and possessed an enjoyable climate, with sufficient rain to maintain vigorous growth. Goats were then introduced, and a fairly profitable industry sprang up in connection with them. The goats had not been there a great length of time before they commenced depredations on the forests, and by eating the bark and leaves caused the death of a great number of the trees. Some more far-seeing individuals drew the attention of the authorities to the matter, protesting that in a brief time the island would be treeless if the goats were not restricted. The authorities made answer that the goats were of more importance than the trees, and so the matter dropped, till finally they cleared off vegetation. The climate then gradually changed. The hillsides being bare, there was nothing to prevent the fertile soil from being swept away by rains and winds; soon it was impossible to grow anything satisfactorily, and finally it became a bleak, barren area, and for agricultural purposes valueless, and so through this short-sighted policy they lost both trees and goats.

"But how can the loss of trees cause this?" it may be asked. The answer is, trees conserve moisture, and moisture affects the temperature, the two being correlative—affecting each other. Firstly, trees intercept the moisture-laden winds, causing them to deposit the rain; owing to resistance, the velocity of the wind is lessened, consequently a greater fall. Then, as the tree roots have penetrated the subsoil, the water is able to reach greater depths, thus conserving a larger supply to the soil, and, as the foliage breaks the sun's rays, evaporation is not so rapid. These two causes enable evaporation to be continued over a longer period than if the land were treeless. Another effect generally overlooked is that moisture attracts moisture, a statement we can easily prove by taking

a damp and a dry cloth to wipe up any water that may be spilt; we find that the damp cloth absorbs far more rapidly than the dry one, in like manner a humid atmosphere attracts the moisture borne by the wind, causing more frequent rains and lesser quantities at a time, an effect most beneficial to agriculture.

Evaporation results in the loss of heat, so it is not surprising to find that a country that has been reafforested, in some cases, results in a decrease of the average mean temperature, but as the loss is chiefly perceptible in the summer, it is more beneficial than otherwise. On the other hand, a humid atmosphere is not such a good conductor of heat, as instanced by land adjoining the sea; this has a more equable temperature than land in the same parallel further inland.

At different times I have met those who argue that as frosts are generally more severe in a valley, it is due to the humid atmosphere conducting the cold; this is not the reason, but owing to the natural law of cold air being heavier than the warmer, therefore the cold air sinks in the valleys; hence the sharper frosts. In some modern orchards there is an equipment by which water is diffused in a fine spray in the air over the trees and successfully used in warding off severe frosts. From these illustrations we can see that humidity in the atmosphere is advantageous, and as trees tend to produce a more constant degree of humidity, forests are of value to the agricultural community at large.

From the health standpoint trees have a very beneficial influence. Most of us are aware of the action of vegetation by transpiration—that is, the process of taking in carbon-dioxide, a gaseous combination deleterious to animal health, retaining the carbon and liberating the oxygen to again combine in the atmosphere. Trees, owing to their height and dense leafage, are powerful air filters, and if we were to take the leaves from a large tree, and lay them all on a flat surface, we should be greatly surprised at the area they would cover. in some cases exceeding the space (flat ground measurement) by over a hundred times, so we can form a rough idea of the value of a tree versus other vegetation for this purpose. Bacteriologists affirm that in the vicinity of trees there are a greater number of less harmful germs than are found in treeless spaces.

Water flowing from an afforested region is purer, and issues in larger quantities than from the same extent of open country—a point worthy of consideration by water board authorities* On the other hand, trees should not be permitted too near the reservoir, as the action of the roots opening up the subsoil allows a greater escape, and the leaves falling and decaying in the water are, to a certain extent, harmful.

On the æsthetic theme much might be written, but for the present I will leave this out. Stockowners have proved that a certain extent of ground occupied by shelter trees enables a larger number of stock to be carried than if all was under grass. The cause is not far to seek. We know that a certain amount of food has to be utilised to create bodily heat, and as trees assist to retain heat the cattle require to eat less than

* This point has already been taken cognisance of by the Metropolitan Water and Sewerage Board in this State.—Ed. "Q.A.J."

if not so provided. In the hot weather cattle will be found peacefully reposing in the shade, whilst in an open paddock they may be seen walking restlessly about, which is not conducive to either good temper or condition. When in conversation with an old inhabitant of this country, how frequently we hear this lament: "In the old days we had warmer winters and cooler summers, and you could rely on the weather: besides, we had none of the diseases in potatoes, peaches, and other things, and spraying was unknown," and so they run on. Whilst allowing a little for faulty memory, there is undoubtedly a modicum of truth in their statements. Fruitgrowers all know that with a cold, windy spring, diseases such as leaf curl are very rife—in fact, at one time it was thought that leaf curl was caused by cold winds. It is now known to be due to fungi, and its rapid increase under the above conditions is not that the bacteria flourish more with weather of that description, but that the vitality of the plant is lessened, consequently it has less resistant power, and, in many cases, a rule that applies to plants applies to animals also.

It is very noticeable that when the true native bush is cut out, it never reverts to the original state; even if a clump is left untouched it rapidly dies out. How seldom we see a good specimen of kauri, totara, or other truly native trees outside virginal bush. Even young trees, grown under cultivation, soon assume a gaunt, ragged appearance. "What cannot speak cannot lie" is an old axiom. They prove that it is not what it used to be, and that climatic conditions are more harsh, due to excessive clearance of the bush.

Droughts similar to that experienced last summer are not welcome, but they will be more regular visitors if the wholesale slaughter of forest goes on unchecked. It is not an individual question; it is a national one. In this country we have not, nor do we wish for, large areas reserved for sporting purposes and the preservation of game; but if the Government passed an Act compelling every landowner of more than 10 acres to either plant or retain uncut, say, a 2½ per centage of his farm under timber, the farmer would for his own benefit reserve it on the bleakest portion, and good result to all would ensue. There are thousands of acres in this country to-day—land of poor quality and steep of grade—that was covered with bush, now cleared and under grass, that in a few years will be valueless, as grass will not hold; yet land adjoining, similar in character, is being served in like manner. This ought not to be allowed; it should be retained for Crown forest reserve, and no one would be the loser. The Government is doing good work at Rotorua and other places, but what is so little amongst so much? We have incurred expenditure for a Commission to inform us that we are running short of timber, and that reafforestation is necessary, and what has been done in consequence? Away back in the country, on a summer's evening, there may be seen the glow of countless fires, proving that devastation is going on as rapidly as ever, and with the exception of a few shelter belts and a few trees around the homestead, what is there to compensate?

The sooner the matter is tackled the easier it will be. It can be dealt with in such a manner that it will not fall heavily on any one individual, and for want of a better suggestion I am giving a rough outline of how

this may be accomplished, and feel sure that as the subject appeals alike to the commercial, health-giving and æsthetic instincts it will not be difficult to carry it into effect.

I commenced by a description of the harmful result of deforestation, and will conclude with a proved trial of comparatively recent times of the beneficent effect of reafforestation. In the south-west of France is a province known as the Landes, that was at one time one of the poorest and least inhabited of any in that populous country. It included a large area of swampy land, low-lying, difficult to drain, and practically valueless. The climate was bleak, suffering from a frequency of cold fogs, comparatively unhealthy, and the sparse population held a meagre existence. It is probably reminiscent to our schoolboy days as a place where most of the inhabitants went about on stilts, it being impossible in many parts to get about by any other means on account of the marshy nature of the country. A number of years ago the French Government set about to reclaim it, and it was accomplished in the following manner. Firstly they planted willows; thereupon sprang up the osier industry with the allied trade of basket-making, wickerwork, &c., finding employment for a number of individuals. After a time, owing to the willows dropping their foliage annually, and the roots retaining the silt washed from the highlands, it became possible to plant other varieties of trees on the land thus reclaimed. The forestry industry then sprang up with allied industries, timber-cutting, charcoal burning, and so on—this industry gradually supervening the willow working trade. To-day there are portions where it is possible to grow wheat and other crops, and the climate is most pleasant and healthy—most of the former unpleasant features are almost banished, and the province is an asset by no means to be despised by the country at large. This surely is a triumph of human ingenuity, working against nature, by the aid of nature, for the benefit of man.

SUGGESTION FOR NATIONAL REAFFORESTATION.

AN OUTLINE FOR A NECESSARY ACT.

Every person owning land to the amount of 10 acres or more shall retain, plant, or cause to be planted, not less than 2½ per cent. of the whole in forest trees. The trees selected shall be at the owner's discretion, provided that under normal conditions they may be expected to attain a height of not less than 20 ft. and 1 ft. in diameter of trunk. Stone and pip fruit trees excluded. The method of planting and reservation may be either as shelter belts, plantations, clumps, or isolated specimens.

For computation, the following number of trees to be considered equivalent to a 2½ per centage. Isolated specimens, an average of not less than three to an acre; clumps (three trees or more, not less than 6 ft. apart), an average of six trees per acre; plantations or shelter belts, an average of not less than seventeen trees per acre planted 4 ft. apart or more—equal to in all an average of one tree per 8 ft. square to area planted.

In plantations and shelter belts measurement of area may also be resorted to; in that case the measurements shall be taken 6 ft. from the trunk, outside the line of trees, &c.

There would be several other clauses necessary, defining the ownership of the trees, prevention of planting evergreen species within a chain of public road, distance from boundaries, *re* possible nuisance or damage, &c., too numerous to mention here. The Government should also assist by publishing leaflets descriptive of suitable trees, their treatment, requirements, &c. They should also obtain seeds of the most useful kinds, and supply at cost price to *bonâ fide* planters. I quite believe the opposition to some such method would be practically negligible, and in twenty years from the time the Act was enforced there would be a huge national asset.

A SUGGESTION FROM JAMAICA.

The "Journal of the Jamaica Agricultural Society," referring to the casual way in which many recipients of that journal read it, approves of the suggestion by the chairman of a Branch Agricultural Society:—

"That at each meeting a member (or members) of the Branch should be appointed to read the last issue of the Journal previous to the next meeting and select therefrom what in his opinion is the best and most useful article for the particular Branch and discuss it at the next meeting, and that it should be put on the Agenda as a part of the regular business of each meeting.

"This is an excellent idea and a very practical method of ensuring that the articles in the Journal reach most of those which they are intended for. We know from letters we receive that the Journal is often read so casually that we are written to, asking for exactly the same information as was already given in the Journal the month previously."

[We constantly are having questions sent to the "Q.A. Journal" by subscribers, who, if they had read their latest Journal, would have saved themselves and us the trouble of writing and the cost of postage.—Ed. "Q.A.J."]

Tropical Industries.

COTTON-GROWING IN QUEENSLAND.

By DANIEL JONES.

My object in asking the Editor of this "Journal" to give space for the photograph accompanying this article is not so much to attract attention to the general pursuit of cotton culture as to dispel the many fallacies which some persons will persist in expressing; and thereby retard the growth of a much required and important vocation.

As I have frequently pointed out, conditions in Queensland do not in any sense compare with those of other countries, inasmuch as our labour conditions, our climate, our seasons are all factors that bear materially on the successful conduct of this pursuit. For many reasons, too numerous to recapitulate, this industry has suffered woeful neglect. As a consequence, rural pursuits are not nearly so advanced as if this crop had been held before the farmers' attention in the way its merits deserve. As space will not permit of a lengthy article, I will briefly confine myself to the questions relating to its perennial character, its longevity, its acclimated virtues, its drought resistant features, and its auxiliary value as a stock fodder in periods of drought.

The illustration depicts a shrub of Jones' Hybrid, a fibre which I have been closely observing for the past ten years with some considerable degree of interest.

This variety was first observed in numerous fields of cotton in 1906, and, as far as can be surmised, is a sport originating from a Sea Island variety (Seabrook) and an Upland Type (Russell's Big Boll). I have seen this shrub thriving in fields remotely apart as Capella and Cleveland, while the best and most prolific in field culture was found at Beeville, near Goodna, on Mr. Butler's farm.

Unfortunately, field tests on a large scale have not been carried on; nevertheless the species from all appearances is likely to prove a welcome strain, and one that may be of high commercial value.

In reporting on a sample of this fibre, Mr. J. C. Atkins, the secretary of the British Cotton Growing Association, states that the sample sent was good and worth at that time 1s. per lb. in Liverpool. He further remarks:—"It appears to me you have succeeded in securing a good hybrid which will probably, as you suggest, yield considerably more than Sea Island. I feel sure that it will pay to export this quality of cotton to England, as it is much preferable to Caravonica."

Some samples have been reported on by Mr. J. C. Brünnich, the Chemist to the Department of Agriculture, for approximation of lint to seed in the specimens submitted.

Three tests were made which indicated the ratio of seed to lint as being 32 per cent. to 32 to 36 per cent of fibre, a very satisfactory average. It is claimed that our Mascotte types of cotton have a higher percentage of lint to fibre than is quoted here.

The shrub here illustrated has cropped regularly for the past eight years, and yields have been forthcoming of from 2 to 4 lb. of seed cotton. In field practice, when growing herbaceous types, it is regarded as

PLATE 11.—A VETERAN COTTON BUSH, TEN YEARS OLD, JONES' HYBRID.

profitable if 4 to 6 ounces per shrub can be gathered. The subject of hybridisation of cotton has so far received little attention from anyone save Dr. Tom Bancroft, who, some few years since, crossed several varieties, one of which is now growing in the Botanic Gardens, and is a

cross of Seabrook and Toole's Improved, an Upland variety, from which a Fassifern grower, in 1895, secured a crop of 2,000 lb. per acre. Unfortunately, this seed was not saved for further sowing, an oversight which is much to be regretted.

THE HYBRIDISATION OF COTTON.

The matter of the hybridisation of the cotton plant is one that holds out great prospects in Queensland. The numerous varieties flourishing in a more or less wild state throughout the country, many by natural crossing, have originated new and meritorious qualities noted for either hardihood or length and strength of fibre, factors indicating that a careful search and a judicious selection will place in our possession varieties of cotton surpassing any that can be imported, and so acclimated to our conditions that the initial risks ever present in experimenting with exotic species will be considerably lessened.

My personal knowledge of these, so to speak, "volunteer" varieties, which have been submitted or observed, from such regions as the Gulf of Carpentaria, Cape York Peninsula, westward to Winton, Charleville, Texas, and Longreach, indicates a wide habitat in which the plant thrives. In a recent letter from an American seed house to Messrs. Joyce Bros., commenting on a variety of cotton supplied that firm when some time since they were engaged in the trade, there is given valuable testimony to the adaptability of our climatic conditions as regards the improvement of types. The letter stated that the example of local-grown cotton forwarded, grown originally from the American seed, showed considerable improvement in quality of fibre, and the recipients were of opinion that a decided improvement in the quality of cotton might be made by the exchange of seed and experimental work conducted in this way.

So prolific and hardy have many of these acclimated cottons become, that in places in the North I have observed the local roadways obstructed by the growth of this self-sown cotton, compelling the local authorities to take steps for its abatement.

THE LONGEVITY OF THE PLANT.

The longevity of the cotton shrub is a factor of great value, inasmuch as the question of rainfall, a critical point in the matter of annual sowing, is largely eliminated. In those districts in the State where the climatic conditions are suitable for this practice the growth of cotton as a perennial has all to commend itself to prospective planters. The lessened expense and anxiety associated with annual planting is avoided. A cotton farmer the other day, in the midst of a very dry period, averred his indifference as to a season's rainfall, instancing the plot of cotton under notice as being established, and his future crop thus assured.

The illustration depicts a shrub, the seed of which was sown eight years ago, and has been bearing continuously ever since. As proof of the hardihood of some species of the plant, I observed some two months ago, cotton plants struggling that were sown five years previously, and had for the past two years been regularly browsed on by stock. This I claim to be a clear testimony of the hardihood of the shrub, enduring,

as in this case, both the browsing of animals and the vicissitudes of drought. In the more northern parts of the State shrubs are known to thrive up to fifteen years, cropping regularly; and, in fact, being often considered a nuisance. I have frequently inquired as to the whereabouts of shrubs formerly observed, and have been told by the tidy housewife that they created such a mess with the dropping fibre they had to be cut down.

This is surely a clear instance of dirt being matter in the wrong place.

ACCLIMATISED VARIETIES OF COTTON.

During my numerous investigations in search of improved sorts, I have observed several types which, through long years of, so to speak, self-acclimatisation, have developed distinct characteristics in relation to quality, colour, and length of fibre, as well as disclosing different habits of growth.

These variations are undoubtedly caused partially by climatic conditions as well as self-hybridisation.

Here the law of Mendel undoubtedly has its influence in a marked degree, and if careful investigation could be made of the variations to be seen, and traced to their source, much might be learned in regard to the improvement of the cotton plant. At Capella I noticed a variety unique in its habit, a most prolific cropper, which had been growing for several years unattended. In the same locality also I observed another type, totally different in colour of fibre and not so prolific. At Gordon Downs I noticed an arboraceous species which was cut down annually by frost, but bore excellent crops of one of the best staples I have observed growing on that class of shrub.

At Charters Towers I also found a variety of special merit, acclimatised, and which should be preserved, if possible, for plantation experiments. At Cape York there was growing in the plantation established by Mr. Frank Jardine a variety of herbaceous cotton having one of the best staples I have examined. Mr. Buhot, when acting as Stock Inspector in the Gulf country, submitted a "volunteer"-growing cotton of exceptional quality. All these instances prove that a collection of varieties already acclimatised would prove of advantage to prospective cotton-growers. These shrubs, succeeding as they do in such diverse localities, afford evidence commending this pursuit to new settlers.

AN AUXILIARY TO SHEEP FARMING.

Nor is it only for its fibre value that cotton can be appraised. Past experience has abundantly established it to be a standby in periods of drought. While it is by no means claimed to be a stock food, it, nevertheless, has on many an occasion demonstrated its value to dairy and sheep farmers as a natural silo when failure of other forms of vegetation rendered the position of the settler one of anxiety for the lives of his animals.

In the early days of cotton-growing, the expectation of being able to turn stock on to the harvested cotton plantations relieved anxiety

about winter feed. In those days our stock were carried through the winter season with less trouble than otherwise would have been the case. Our working stock and cows were tided over the sparse months, and when spring came were sleek and in fit condition for work.

From personal knowledge, I am confirmed in the opinion that if cotton plantations existed to the extent they might have attained, the loss of stock during the late drought to the small dairyman or sheepbreeder would not have been so acute as has been experienced in the calamitous period now happily passing away.

The beekeeper will also find in the cotton shrub a source of pollen in the early springtime, when he requires it most owing to the absence of other bloom.

As a cattle food the seed of the plant is valuable, while the oil industries of the world are largely dependent on the cotton fields for the great part of their needs.

I have, in this necessarily brief article, but advanced a tithe of the many advantages accruing from or associated with such a vocation as herewith now under consideration.

America finds the cotton industry one of the chief goldwinners for her farmers. In 1914 the value of exports of raw cotton from that country reached £150,000,000. As a factor in closer settlement, and also in any scheme for the establishment of "Ready-made Farms," the cotton plant holds out encouraging prospects. The vocation requires less experience, capital, or farm knowledge than any in vogue in Queensland.

As an auxiliary to dairying, sheepbreeding, beekeeping, and being a crop so drought-resisting, as also of high initial value, which does not deteriorate by ordinary exposure to the elements, as is the case with some farm crops, it has much to commend it to the notice of prospective settlers, either in the Commonwealth or elsewhere.

The imports into the Commonwealth in 1914 of raw cotton, chiefly from India, amounted, according to an estimate of the Federal authorities, to £47,700 worth of fibre which (and much more) could easily be furnished from Queensland farms.

COTTON-PICKING.

An important feature of cotton hybridisation is to secure a free-opening boll, which will lend itself to the enabling of mechanical devices to be used in the picking of the fibre.

American experiments have so far signally failed to invent a cotton-picking machine, largely owing to their inability to grow perennial types. These are usually free-picking varieties, the fibre of which, not being so adhesive to the capsule, and when fully matured hangs pendent so that a very slight pull will draw the fibre out.

I have, for some years, given attention to the selection of varieties that will be of value in respect to the utilisation of mechanical appliances and thus accelerate the harvesting of the cotton crop, the idea being to raise a cotton to suit machine-picking.

Recent tests of an appliance in Brisbane indicate that there is a probability of some degree of success, particularly when operating on the free varieties. It is well known that certain types are so adhesive to the boll that difficulty is experienced in freeing the cotton from the boll.

Such varieties as Sea Island and most of the Upland sorts are of this class; hence, in plantbreeding, this aspect must be taken into account, it being an important factor in the cost of harvesting a crop of cotton.

Size of boll, height of plant, hardihood, immunity to plant diseases, quality of fibre, period of ripening; all these call for attention when carrying out experiments in the improvement of the cotton plant.

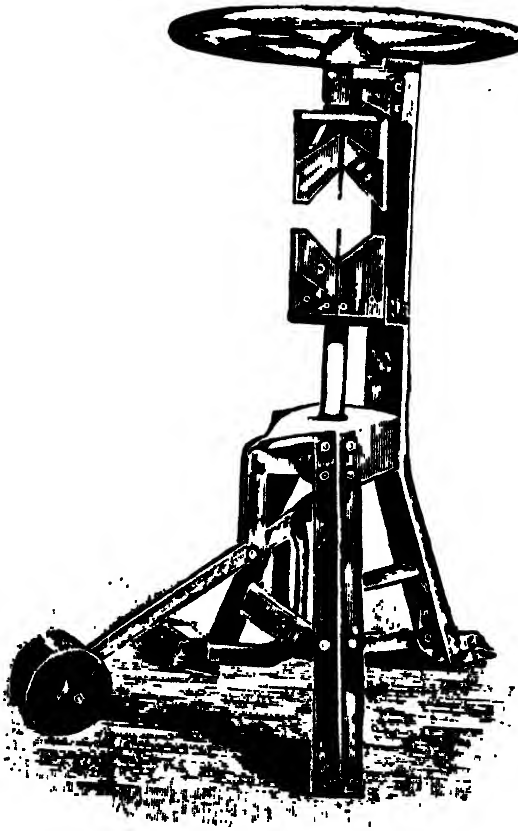
Now that the public mind is so much exercised by the problem of dealing with returned soldiers, I may be pardoned for indicating the unique merits of this crop as a factor in the preparation of "Ready-made Farms" for returned soldiers.

THE PREPARATION OF COPRA.

The methods of preparing copra are briefly as follow:—The outer fibrous husk (the coir from which ropes and mats are made) which envelopes the hard shell of the coconut is first removed. This is usually effected by striking the coconut on to the pointed end of a hard piece of wood or iron bar fixed firmly in the ground. A few sharp blows, followed by twists on the part of the operator, loosens the husk, which is then pulled off by hand. The husked nut is then split in two by cutting through the hard shell and kernel with a hatchet. The watery contents (so-called milk) are drained away, and the halves are placed on a clean piece of sandy ground or on a rough platform fully exposed to the sun, with their hollow sides uppermost. After a few hours' exposure, the portions of the kernel left in the halved nuts shrink sufficiently to allow of their being readily removed from the shells, and the separation of shells and kernels is the next operation. The kernels are then further exposed to the sun for several days, being frequently turned at short intervals, until sufficiently dry to be bagged for export. Copra prepared in this manner is known on the market as "sun-dried" copra, and if carefully and quickly made from thoroughly ripe nuts is usually of good quality. In order to expedite the drying process, the kernels, after being removed from the shells, are sometimes placed on tables of sheet iron protected from rain, or on a "grille" made of green saplings or bamboo over a fire of coconut shells. By this treatment, drying is completed in from twenty-four to thirty-six hours, but frequently the copra becomes blackened owing to contact with smoke from the fire, and has a smoky smell, in consequence of which its market value is lowered. Copra prepared in this manner is known as "kiln-dried," "smoke-dried," or "smoked" copra. During recent years specially constructed copra-

drying houses and machines have come into use, fitted with heating plant which maintains a current of hot, dry air, to which the kernels are exposed. The drying process is completed in a few hours by means of these contrivances, and copra of high quality is produced. This copra is known in commerce as "hot-air dried" copra. The care bestowed on the preparation of copra has considerable influence on the products subsequently derived from it, therefore clean, carefully prepared copra fetches the highest price on the market. If properly prepared from ripe nuts, copra is greyish white, and free from dirt and mould, and of an agreeable nut-like odour. Copra imperfectly dried is liable to the attacks of fungi, which cause discoloration and deterioration. It then has an unpleasant, often black appearance, is soft, and frequently of disagreeable odour. If kept dry, carefully prepared copra will remain in good condition for a long time. A considerable amount of copra is made in and exported from Papua. In 1913-14 the Papuan exports amounted to 24,020 cwt., of a value of £26,063. The value of the export of copra from the Solomon Islands (British) in the same year was £73,637.

The above notes on Copra are derived from an interesting book on Oil Seeds and Feeding Cakes, issued by the Imperial Institute, London, 1915.



Professor Dunstan, Director of the Imperial Institute in, we think, 1913, transmitted to the Ceylon Agricultural Society some useful information with reference to the latest developments in machinery for treating coconuts, especially with regard to the separation of the husk, which, as above stated, is, at present, wrenched off by hand with the aid of a spike in the ground.

We described, in the May issue of the "Queensland Agricultural Journal," 1913, a machine which cuts the entire layer of fibre into three longitudinal segments, which can then easily be removed by hand. With the aid of this machine, a skilled workman can remove the husks from as many as 100 nuts per hour. The illustration will explain the structure of the machine.

BERSEEM.

Referring to the note on Berseem Clover in the January issue of the "Journal"—this wonderful fodder plant (says the "Fruit World," Melbourne) has been introduced from Egypt, and has given splendid results wherever grown throughout the irrigation areas in the northern parts of Victoria. It is not generally known that there are four varieties of Berseem. The only one suitable for Victoria is Mesgawi. This is by far the most important variety. It is tall, luxuriant in growth, and yields an astonishing amount of green fodder. Where it can be grown in irrigated areas as many as five cuts can be obtained in a season. To derive the full benefit of the plant, the seed should be sown as soon as possible after the first autumn rains, or, in places where water is plentiful, early in February. Berseem is also used as a green manuring crop prior to the sowing of lucerne, and it is in this respect that we anticipate it will be mostly grown in Victoria. Messrs. F. H. Bunning Pty., Ltd., of 64 Elizabeth street, Melbourne, have just landed a large stock of new crop Berseem Clover seed and will be pleased to submit samples and send further particulars on application.

Botany.

NOTES BY THE GOVERNMENT BOTANIST—NO. 2.

TWO USEFUL TEA TREES (LEPTOSPERMUM).

(Plates 12 and 13.)

In 1905 R. T. Baker, F.L.S., and H. G. Smith, F.C.S., of the Technological Museum, Sydney, described in the proceedings of the Royal Society of New South Wales a new species of Leptospermum under the name of L. Liversidgei, and as this species and a variety of the well-known plant Leptospermum flavescens with probably the same properties, are found in this State and may prove of economic interest, it has been considered advisable to draw attention to their presence.

The feature about these two plants is the presence of a strong-scented oil of a citron odour similar to that possessed by the Citron-scented Gum (Eucalyptus citriodora).

L. Liversidgei occurs in abundance on the mainland and islands along our coast from Point Danger to about Bundaberg, and so far as observed makes a shrubby growth only. The new variety of L. flavescens, to which the name *citratum* (Bail. f. and White) has been attached, was recently found by C. T. White at Springbrook, on the Macpherson Range, where, like the normal form in other places, it forms a large shrub, occasionally making a small tree up to twenty feet high.

Should these plants furnish an oil equal to that of the Citron-scented Gum in value, it might prove profitable to cultivate the plants for the sake of this product, as, like other species of the genus, plants could be propagated by cuttings and put out to form hedges or individual specimens, and with judicious pruning at certain seasons of the year could be made to produce crops for many years. Unlike the Eucalypts the Leptospermums are liable to drop their leaves during the process of drying, therefore this would have to be taken into consideration when preparing the crop.

Baker and Smith give the composition of the oil of L. Liversidgei as—

Citral	35·00 p.c.
Geranyl-acetate	5·35 p.c.
Free Geraniol	9·74 p.c.
Dextro-pinene	25·00 p.c.
Sesquiterpene and undetermined ..	24·91 p.c.
	100·00 p.c.

Besides the vernacular name Tea Tree the Leptospermums are also known as Native May; the former name was attached owing to the fact that the leaves of L. scoparium were used during one of Captain Cook's expeditions as a substitute for tea. The name Tea Tree has also been applied to allied plants, as, for instance, the genus Melaleuca, to which the well-known Paper-barked Tea Tree belongs, but is often erroneously termed Ti Tree.

PLATE 12.—LEPTOSPERMUM LIVERSIDGEI.

PLATE 13.—LEPTOSPERMUM FLAVESCENS, VAR. CITRATUM.

Science.

SOIL ANALYSIS.

Leaflet No. 293, issued by the Board of Agriculture and Fisheries, London, October, 1915, deals as follows with the matter of soil analysis:—

"Inquiries are frequently received by the Board from farmers and gardeners who wish to be informed where they can have soils analysed. In most cases the idea appears to be entertained that having a soil analysed is a ready means of determining its manurial requirements or of obtaining an indication of its fertility. A brief discussion as to how far this view is correct may therefore serve a useful purpose.

"A complete soil analysis includes chemical, physical, and bacteriological investigations, and may be accompanied by general field observations for the purpose of ascertaining the nature of the subsoil, the water supply, and climatic and other conditions important for the growth of plants. A full investigation of this kind, however, is very laborious, and in practice the analysis is usually less comprehensive, and aims not so much at giving a complete account of the soil as at determining the amounts of certain substances present in the soil which are known to have an important effect on crop production.

"Experience has shown that a soil analysis is of little practical value when the interpretation is based on the results obtained from an isolated sample of soil from a district of which the analyst has no intimate knowledge. In certain special cases, *e.g.*, where it is required to determine whether a soil is in need of liming, an analysis may be of great assistance to the farmer, but even where the investigation is a comprehensive one the analyst can only give a very incomplete idea of the general fertility of a particular field. It is difficult to place an absolute value on the results, and the element of uncertainty enters too largely into the interpretation. The difficulty will be appreciated if an attempt is made to obtain information as to the best system of manuring.

"The analyst can determine as accurately as need be the percentages of nitrogen, phosphates, and potash in the soil, but it has been found that, even where external factors, such as climate, depth of soil, &c., do not enter into the case, there is often little or no connection between these percentages and the soil's fertility or its manurial requirements. Any ordinary soil contains much more total plant food of all forms than a single crop of any kind can possibly require. Most of this plant food, however, is in a condition in which the plant cannot make immediate use of it, and is only gradually made available, the rate varying in different cases. As the plant can only make use of the free or available food, it is clear that it is possible for one soil containing quite small amounts of the manurial substances to produce better crops than another soil containing large quantities, if for any reason the first soil gives up

its material to the plant at a more rapid rate than the second. In fact, some soils contain large quantities of nitrogen and still respond most readily to small dressings of manure containing available nitrogen, because practically all that is already in the soil is unavailable and, as far as the plant is concerned, might almost as well not be there at all. This also holds equally for phosphatic compounds; a soil may contain a good deal of phosphate and yet respond to more.

"It is true that in the case of phosphates and potash a method has been devised of roughly measuring the amount which may be regarded as of immediate or prospective value to the plant, by ascertaining the quantity which is dissolved out in a given time by a weak solution of citric acid. This method gives results which in many cases indicate fairly well whether a particular soil will respond to an application of either of the two kinds of manure, and may be used in comparing soils of the same class. At the same time, there are many cases where the results obtained are at variance with those obtained by actual experiment in the field, and so far no ready method has been discovered by which the availability of the nitrogen in the soil can be estimated, except as regards the small amount present in the form of nitrates or of ammonium salts. It will be seen, therefore, that chemical analysis of an isolated sample of soil can hardly be expected to supply a very accurate and reliable means of determining its manurial requirements, and it is probable that a simple field experiment would yield better results.

"It is not only a question of what the soil contains, but also of what the plant needs. A plant is a living thing and its needs are not constant, but vary with the conditions under which it is grown. Thus a plant *needs* more phosphates on a clay soil than it would on a sandy soil, and it *needs* more potash on a sandy or peat soil than on a loam. Again, a plant growing in a district receiving 32 or more inches of rain is in greater need of phosphates than in districts with less than 24 inches of rain.

"Further, under present conditions an isolated mechanical analysis cannot be considered of much value to the farmer. By means of a mechanical analysis it is possible to measure the proportions of particles of different degrees of coarseness in the soil, and so determine to some extent the ability of the soil to meet the plant's requirements as regards the supply of water and the proper aeration of the soil. At present, however, it is probable that an experienced farmer would be able to gain more useful and accurate information by examining the land carefully at different times of the year.

"Directions in which a Soil Analysis may be Useful.

"While isolated soil analyses are of little practical value at present, there are one or two directions in which an analysis can afford useful assistance.

"1. A farmer may wish to know whether he has any reasonable chance of obtaining results similar to those demonstrated by field experiments on another farm in the locality. Where such experiments have shown the advantage of applying lime, phosphates, or potash, the analyst

can determine whether similar results are likely to be obtained on the soil which he analyses. The element of uncertainty will always be present, but there is every prospect that the advice will prove to be correct. In this way the farmer may be saved much time and expense in carrying out the experiment for himself.

"2. A soil analysis may also prove of assistance where a farmer proposes to introduce a system of cropping or tillage known to give good results elsewhere in the locality, but before doing so wishes to compare his soil with that on which the system is successful. Analysis may reveal differences which although not obvious to casual inspection are of vital importance to the success of the enterprise. Two heavy soils, for instance, may look very similar, but one may owe its heaviness to very fine particles, and the other to silt particles, and the methods successful in one case may prove failures in the other.

"3. A farmer entering a new farm may wish to obtain complete information as to the possibilities of the soil, with a view to taking up some special branch of production, or ascertaining for what special crops the soil is suited. A soil analysis will show whether the soil and general conditions resemble those obtaining where the proposed system of farming is known to be a success. Where important differences are revealed the farmer may be able, with the assistance of the agricultural expert, to modify the scheme so as to adapt it to the possibilities of his soil.

"It will be gathered from the above notes that the maximum assistance can only be obtained from a soil analysis when data are available for comparison with soils of the same type. Fortunately, the country is now provided with organised schemes under which systematic investigations may be made and the results recorded. Soil surveys supplying fairly full information with regard to special classes of soil in a limited area, and carefully conducted field experiments, are being carried out in many parts of the country. As time goes on, therefore, the possibility of setting up comparisons will steadily increase and analyses will be of correspondingly greater value.

NEW WAY TO GET POTASH.

Potash from feldspar is the latest announcement of scientific men. Dr. Thomas H. Norton, the Department of Commerce's commercial agent, announces that a young New York chemist has discovered a new process for extracting potash from the feldspar which is found in such large quantities in the Allegheny mountains.

Aluminum, silica, and potash are closely united in the feldspar and acids do not liberate them. Dr. Norton says an alkaline process is used before they can be split with acids. This releases the aluminum quickly and cheaply, and gives potassium carbonate almost directly from the rock. With potash in this form we can immediately get any kind of potash salts, including nitrate. The aluminium is also of much value, for 300 tons daily of this product is now required in our industries.—"Fruit World."

Vegetable Pathology.

A METHOD OF RENDERING CUCUMBER AND TOMATO PLANTS IMMUNE AGAINST FUNGUS PARASITES.

The prevalence of tomato diseases of late years renders it imperative that growers should be able to recognise the early symptoms of diseases, so that remedies may be applied before they have got beyond control. In the event of their not being able to determine any particular disease, there should be no hesitation in seeking the advice of the Entomologist and Vegetable Pathologist of the Department of Agriculture and Stock, Mr. H. Tryon. Meanwhile it may be of service to record some successful experiments conducted at Kew Gardens, England, by Mr. George Massee, V.M.H., of Kew, in 1903.

We cite as one subject of the experiments for combating fungoid diseases a minute fungus not uncommon in Britain and other countries, known as *Dendryphium comosum.* Previous to the present record, *Dendryphium* had never been known to act as a destructive parasite, and its becoming so was entirely due to its accidental introduction along with the manure to a set of conditions which enabled it to assume a parasitic existence on plants already predisposed to disease. As far as cucumbers are concerned, the experiments conducted at Kew proved conclusively that *Dendryphium* cannot attack these plants when growing in a cool frame. The use of fungicides in the form of sprays did not by any means produce the results desired and anticipated, and further experiments demonstrated that, under the conditions necessary for the rapid production of cucumbers, the daily syringing and constantly damp surface of the foliage render useless those fungicides which, when applied under more favourable circumstances, have proved effective.

A series of experiments was then carried out in order to ascertain whether some substance taken up by the roots of cucumbers and tomatoes would not render plants thus treated immune against the attacks of fungus parasites, without, at the same time, exercising any injurious or retarding effect on growth or on the production of fruit.

From among the various substances tested, sulphate of copper alone met all the above requirements. The treatment, generally speaking, consisted in watering the plants every third day with a solution consisting of one part of copper in 7,000 parts of water. The check plants, which were untreated, were indiscriminately mixed with the treated plants. The watering was done in the afternoon, and the quantity used with each plant was sufficient to soak the soil thoroughly.

After a month's treatment, all the tomato plants were perfectly free from disease, but of 300 cucumber plants, 34 showed blotches of the disease, while most of the check plants, tomatoes and cucumbers, were badly diseased.

At this stage both treated and check (untreated) plants were sprayed with water containing the spores causing their respective diseases, and this was continued weekly until the end of the experiments. Under this drastic treatment all the untreated check plants were badly diseased during the following two weeks. After six weeks' treatment with the solution of copper, as above, the strength was increased to 1 part of sulphate of copper in 6,000 parts of water, and the soil was soaked every fourth day to the end of the experiments, which lasted eleven weeks. At the expiration of this period both tomato and cucumber plants were bearing a good crop of well-matured fruit. Not a single one of the tomato plants so treated showed a trace of disease, and, in the case of the cucumbers, the disease never extended beyond the cotyledons, and this notwithstanding the fact that badly diseased plants were growing amongst the treated plants during the whole period.

PRACTICAL DIRECTIONS FOR TREATMENT.

Commence watering cucumbers and tomatoes, when a fortnight old, every third day with a solution consisting of 1 oz. of sulphate of copper dissolved in 50 gallons of water. After treating for six weeks as above, commence watering every fourth day with a solution consisting of 1 oz. of sulphate of copper in 35 gallons of water. The sulphate of copper should be pure, and rainwater should be used if possible.

It should be stated that the fungus disease (*Dendryphium comosum*) has not yet been noticed in Queensland, but *Fusarium lycopersici* is found, together with other diseases, on the tomato in this State. It does not, however, follow that the above treatment will necessarily be effective here.

THE "AGRICULTURAL GAZETTE" OF TASMANIA.

In the December, 1915, issue of the above publication it was notified that "solely from motives of expediency" the "Gazette" would cease to be issued "for a time at least—perhaps for all time." All who take an interest in the progress of Agriculture, and particularly of fruitgrowing, in Tasmania will regret the cessation of the journal of the Agricultural Department of that State, a journal which for twenty-four years has done good service in the interests of fruitgrowers in all the other States of the Commonwealth.

Entomology.

COMBATING THE CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Entomologist of the Bureau, Mr. Edmund Jarvis:—

From 1 to 2 inches of rain fell at Gordonvale between the 11th and 12th December, and was at once followed by a primary emergence on volcanic soils, near Meringa, of the cane-beetles, *Lepidiota albohirta* and *frenchi*. The former grey-back species was fairly abundant on the Carrah Plantation, but had the season been a normal one would probably have appeared in greater numbers. Unfortunately, the most favourable time for experimentation with light-traps—viz., throughout the week immediately following emergence of the beetles—happened to be moonlight, so it was decided to experiment during this period with various bait-traps, in hopes of discovering one that might prove attractive to the adult insect. Eighteen different odours were tested, both alone and in combination, including oils obtained from plants closely related to those upon which *albohirta* is known to subsist, but no definite reaction was noticed.

We must not, however, expect speedy results from this method of control: in fact, the possibilities of its ultimate success are somewhat uncertain. Had our enemy been a moth or dipteron (two-winged fly) the task would probably have been simplified, as many such insects are very susceptible to the odours of different vegetable and mineral oils.

The cane-beetle in question is a sleepy sort of creature at the best of times, its motions, even when on the wing, being lumbering and ill-directed. Moreover, the wide and varied range of its dietary tends to curtail the chances of our being able to induce reaction towards aromas resembling those associated with the chief food plants of this pest. On the other hand, it is not improbable that flight, prior to oviposition, may be affected to some extent by the occurrence of certain native shrubs having roots more palatable to the future larvæ than those of sugar-cane.

Its aerial movements are certainly influenced very sensibly by (1) topographical conditions, (2) the presence or position of feeding-trees, and (3) the mechanical nature of soils.

Experiments made at the laboratory this month have demonstrated the susceptibility of *albohirta* to various aromas. Details need not be given here, but I may mention that the beetles reacted very noticeably and at once to the odours of cajeput oil, acetic acid, carbolic, and nitrobenzine, but were most strongly affected by oil of almonds. They were not in the least influenced by such substances as oil of cloves, fish oil, or

even the pungent fumes of formalin (40 per cent. strength). Knowledge of the above facts justifies us in assuming that reaction of a positive nature is, at any rate, within the bounds of possibility, and should encourage further research in this connection. Discovery of an attractive aroma would, I feel sure, go a long way towards solving the cane-grub problem. Once succeed in luring the beetles to a given spot, and their capture by mechanical methods would prove a simple matter. This method of repression is being successfully practised in parts of Europe, where bait-traps are extensively used against a formidable vine-moth (*Clysia ambiguella*). At a vineyard in France, for instance, during 1913, some of the catches per acre were 1,200 and 2,400 of these moths, the greater number being females, each capable of laying from 120 to 170 eggs.

A noteworthy instance of direct control brought about by hot weather occurred towards the end of this month. On the 19th instant we experienced a maximum dry temperature of 95 degrees F., following, on 20th instant, by 98 degrees F., the wet bulb on both days registering 86·5 degrees F., while the wind was from the warm quarter (N.W.). During the morning of the latter day cane-beetles (*L. albohirta*) became strangely agitated, and instead of remaining as usual on their food plants were observed to be taking short erratic flights or congregating on the shady side of tree trunks, evidently in a vain attempt to discover a cool resting place. Later, in the afternoon, a party of blacks who were collecting at Meringa told the manager of Currah Plantation that large numbers of cane-beetles were dying and dropping from the trees.

Finding their account to be correct, Mr. Greenaway communicated with this office, and the matter received personal investigation. Upon reaching the locality in question, the ground was seen to be strewn with dead grey-back beetles, mostly under, or in the vicinity of, Moreton Bay Ash trees (*Eucalyptus tesselaris*). No less than 25 were collected from beneath one gum tree of medium size, and in a space containing 2 square chains at random on forest land, Mr. Hadley picked up 98 specimens. Of these, 27 were males, 49 females, and 22 of undeterminate sex owing to injury by ants. The above area was hastily examined, so no doubt we overlooked several specimens hidden among herbage, &c. The occurrence of such heavy mortality acquires additional interest from the fact of its having happened about seven days after the emergence of these beetles, and consequently before they had had time to oviposit. I dissected several, and in all cases found the ovary only partially developed. The specimens contained 26 eggs each, most of which were more than half-grown. Further report on the question of oviposition is deferred until next month.

General Notes.

POISONING GREEN TIMBER WITH SODIUM ARSENATE.

C. W. BURROWS, Assistant Inspector of Agriculture, N.S.W.

In this country, where large areas of land are available for occupation, and are heavily timbered, it is of primary importance to remove the timber, either wholly or in part, in order to increase the productivity of the land, and the quickest means is usually the best.

Ordinary ringbarking is effective if done at the right time in that particular district, for it must be conceded that seasons vary considerably from year to year, making the operation an adjustable one. But ordinary ringbarking has one disadvantage—it is slow, often taking twelve to eighteen months before the trees can be burnt off.

Of late years, the action of arsenic has been introduced with marked success in hastening the killing by the ringbarking process, and trees that ordinarily would take months to kill by the old method are now killed in a few weeks, and frequently in a few days, by the application of arsenic.

Arsenic—the ordinary white arsenious oxide of commerce—costing about 26s. per cwt., is not soluble in water to any extent, so that soda, either the ordinary washing soda at about 5s. per cwt., or caustic soda at about 28s. per cwt., has to be used in conjunction with it, in order to make it soluble.

Should the ordinary washing soda be used, the proportion should be three of soda to one of arsenic, and boiling is necessary to bring about complete solubility. By using caustic soda, proportion of which is two of caustic soda to one of arsenic, the mere addition of water in reasonable quantity generates enormous heat, doing away with the necessity of boiling for the dissolving of the arsenic.

When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution, caustic soda will possibly be found the handiest, as boiling is unnecessary.

In dissolving the arsenic, whether for washing or caustic soda solution, there is one point worth remembering: Do not tip the whole of the arsenic into the solution in a dry state, but mix it to a paste slowly and carefully in the same way as the housewife treats her cornflour, then pour it slowly into the soda solution, stirring it all the time, and be careful to stand on the side away from the fumes, as they are poisonous. When once the soda and arsenic are dissolved and chemically combined, the bulk may be made up to the required dilution by the addition of water.

A useful strength for quick and effective work in all kinds of timber is as follows:—

Arsenic, 1 lb.
Washing soda, 3 lb., or caustic soda, 2 lb.
Water, 4 gallons
Whiting, ½ lb.

The addition of this whiting is merely that it may serve as an indicator on trees treated, as it turns white on slightly drying, making it quite certain what trees have been operated on. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The time to carry out the work of poisoning is when the tree is dormant—that is, when the sap movement is at its minimum and the sap right down in the roots and lower portions of the trunk. This occurs in the winter months from, say, March to July, according to the district, and must necessarily vary between these limits in a State like New South Wales, which embraces such a wide variation of climate. On parts of the North Coast ringbarking has been carried out to the best advantage as late as June and early July in certain years, whereas in the more central parts of the State late February and March have found the sap movements at their lowest.

The main object in catching the sap at the right season is to prevent suckering.

TO GET RID OF MOSQUITOES.

Various suggestions have been made from time to time for the destruction of mosquitoes in tropical countries. An American paper says that a very simple and perfectly effective remedy is to make use of permanganate of potash. Two and a-half hours are required for the development of the full-grown mosquito from the larva. It can be instantly killed, either in its infancy or at maturity by contact with minute quantities of this chemical. A solution of the salt containing only 1 part in 15,000 parts of water distributed in swamps and waterholes where mosquitoes breed will render the development of the larvæ impossible. A handful of permanganate will oxidise a 10-acre swamp, kill all the embryo insects and keep it free from organic matter at a cost of 25 cents (12½d.). An efficacious method is to scatter the crystals wide apart. A single pinch of permanganate has killed all the germs in a 1,000-gallon tank. The above is taken from "The Public Health Journal," U.S.A.

"It has long been known," said the London "Times," that Barbados is the only West Indian island that is absolutely free from malaria and from the presence of the Anopheles mosquito, and the reason for this was soon discovered. It appears that all the pools and swamps in the island were stocked with swarms of a tiny fish (known locally from their vast numbers as "Millions"), and that their favourite food was the larvæ of the mosquito."

For personal protection against mosquitoes, a Zanzibar paper recommended the use of alum. If a piece of alum about the size of a marble is thrown into a bowl of water, and the hands and face wetted with the solution, not a mosquito will approach you. They hum about a little, and disappear.

The "Agricultural News," Barbados (December, 1915) takes the following remedy for mosquitoes in pools and swamps from the "Colonial Journal" of October, 1915:—

"Ducks, which occur in all regions of the globe, are among the greatest enemies of mosquitoes, and consequently of yellow fever and malaria. Their value in this respect has been determined as follows: By means of dams two pools of equal area were made in a stream. Ducks were placed in one and fish in the other. The former was speedily cleared of mosquitoes, whilst the second continued to maintain the insects in all stages of development. Wild ducks were then introduced and found to prefer the insects to all other foods. At the end of twenty-four hours no pupæ were found in the pond, and after two days all the larvæ had been destroyed. These experiments confirm the observations of William Lockwood, who found that the duck was particularly adapted to devouring the larvæ on the surface of water, and of McAtee, who found mosquitoes in the gizzard of a wild duck.

"The mosquito has numerous animal enemies, of which the duck is the most widespread and consequently the most suitable to clean up unhealthy marshy districts which it would be too costly to drain."

AUSTRALIAN WHEAT TO FEED THE WORLD.

MEYER BROTHERS, LIMITED.

The war's fearful devastation of European crops has caused an unusual demand for grain. The people of the world must be fed. Already there is a big demand for Australian wheat, and as time goes on this demand will grow and continue. Farmers must grow more wheat and still more wheat.

The 1915 harvest, so far as Queensland was concerned, was a poor one. This shortage was due to the excessive long spell of dry weather. But was there a real and legitimate reason why such a great loss—we might almost say waste—should be?

Irrigation, the systemised kind of irrigation, would have saved immense crops from destruction and many a farmer from financial ruin. The farmer who has an irrigating system has no fear of a long spell of dry weather. His crops are assured the necessary moisture just when they want it, and the result is always satisfactory from his point of view.

Farmers who want to make money and happy prosperous homes for themselves, and at the same time help this country to raise immense wheat crops, are specially recommended to install the system of irrigation known as Nunan's system.

With this installation on their wheat lands, they are ready to defeat the next dry spell and raise fine, profitable wheat crops. Nunan's is the best, and the only satisfactory irrigation system on the market. Once installed it gives no trouble. A turn of a tap and a fine rain-like moisture is distributed just where needed. The irrigating can be stopped at any point without interfering with the rest of the system.

Nunan's irrigating system costs about as much to put in as it will save you the first year, so that it is not an expenditure but an investment. Just think this out, Mr. Farmer! You paid for this irrigating system last year, but did you get it? Even if you didn't install the Nunan irrigation system you paid for it in lost profits that came from drought losses. You, as well as any other farmer in a drought-infested area, should at least start now and inquire all about this system and its benefits.

With the Nunan irrigating system you have rain easily and quickly available, all ready to nourish the growing plants, to mature a large crop. Nunan's system sends the water high enough into the air for it to become saturated with life-giving oxygen. Don't wait for the rain that "may" come, make sure. Write to Buzacott and Co., Ltd., the irrigation and pumping experts, Adelaide street, Brisbane. Ask them to send you a booklet which fully explains Nunan's system. Address your letter to Desk "B1," and it will receive the manager's personal attention.

PRESERVING BOOT SOLES.

In view of the increasing cost of hides, leather, and consequently of leather footwear, a correspondent points out that shoe leather can be made to last for twice the ordinary time by simply rubbing Stockholm tar into the wearing surface with the fingers. Use as much tar as the leather will take up; allow it to dry; then repeat the operation. Two coats will be sufficient.

Answers to Correspondents.

JOHNSON GRASS.

W. SPEIRS, Kairi—

With reference to your inquiry as to whether a suitable specific can be recommended for the destruction of Johnson Grass, with which your field is overrun, the Director of Agriculture replies that, "although arsenical solutions are used in the case of prickly-pear and some scrub growths, it is almost impracticable to kill Johnson Grass by this means, owing to the fact that the creeping underground stems ramify through the soil and penetrate to a good depth. As you are doubtless aware, these underground stems possess buds at the joints which throw up shoots readily should favourable conditions prevail for plant development. This Department has already experimented in the destruction of Johnson Grass by means of arsenical sprays, and our experiments bear out the above."

In May, 1912, the editor of this Journal paid a visit to Bundaberg with a view to obtaining information concerning the methods of irrigation adopted there on sugar plantations and farms. Amongst other places, an irrigated farm worked by Messrs. Redmond Bros. was visited. Here there were 68 acres under lucerne and maize. We noticed one lucerne field where the Johnson Grass had taken almost entire possession, but Messrs. Redmond did not appear to think the lucerne was in danger of being choked out. They maintained that it was quite easy to get rid of it by mowing it down before it seeded, when the roots gradually rotted out. We subsequently heard that the grass was ultimately destroyed by this means.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1916.

Article.		FEBRUARY. Prices.
Bacon	lb.	1s. 3d. to 1s. 5½d.
Bran	ton	£5 15s. to £6
Broom Millet	„	£33 to £36
Butter	cwt.	125s. to 135s.
Chaff, Mixed	ton	£5 to £5 10s.
Chaff, Oaten	„	£6 to £6 10s.
Chaff, Lucerne	„	£8 to £8 10s.
Chaff, Wheaten	„	£5 10s. to £5 15s.
Cheese	lb.	10d. to 10¼d.
Flour	ton	...
Hams	lb.	1s. 4½d. to 1s. 5d.
Hay, Oaten (Victorian)	ton	...
Hay, Lucerne	„	£5 to £5 5s.
Honey	lb.	5d. to 6½d.
Maize	bush.	6s. 4d. to 6s. 5d.
Oats	bush.	2s. 9d. to 3s.
Onions	ton	£3 15s. to £5 10s.
Peanuts	lb.	4d. to 4¾d.
Pollard	ton	£7 15s.
Potatoes	„	£17 to £18
Potatoes (Sweet)	cwt.	10s. to 12s.
Pumpkins	ton	£10 to £11 10s.
Eggs	doz.	1s. 4d. to 1s. 8d.
Fowls	pair	3s. 6d. to 5s. 9d.
Ducks, English	„	4s. 6d.
Ducks, Muscovy	„	6s. to 6s. 6d.
Geese	„	...
Turkeys (Hens)	„	7s. 6d to 8s. 6d.
Turkeys (Gobblers)	„	20s.
Wheat	bush.	5s. 8d.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	3s. 6d. to 8s.
Beans, per sugar bag	4s. to 9s.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	9d. to 1s. 3d.
Cucumbers, per dozen	1s. 3d. to 2s.
Custard Marrows, per dozen	1s. 6d. to 3s.
Vegetable Marrows, per dozen	1s. 6d. to 3s.
Lettuce, per dozen	9d. to 1s.
Peas, per sugar bag	8s. to 10s.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	...
Sweet Potatoes, per sugar bag	5s. to 6s.
Table Pumpkins, per dozen	2s. to 6s.
Tomatoes, per quarter-case	1s. 9d. to 4s.
Turnips, per dozen bunches	8d. to 1s.
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per case ...	3s. to 9s.
Bananas (Fiji), per case ...	17s.
Bananas (G.M.), per case ...	18s.
Granadillas, per double-case ...	...
Mandarins, per case ...	...
Mangoes, per case ...	2s. to 6s.
Oranges (Navel), American, per case ...	20s.
Oranges (other), Japanese, per case ...	20s.
Passion Fruit, per quarter-case ...	2s. to 6s.
Lemons (Local), per bushel case ...	7s. to 18s.
Papaw Apples, per double-case ...	2s. 6d. to 4s.
Pineapples (Queens), per case ...	7s. 6d. to 10s.
Pineapples (Ripleys), per case ...	5s. to 8s.
Pineapples (Common), per case ...	4s. to 5s.
Rockmelons (Queensland), per case ...	...
Strawberries (Queensland) per tray ...	...
Tomatoes, per quarter-case ...	3s. to 4s. 9d.
Cucumbers, per case ...	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, per case ...	10s. to 14s. 3d.
Apples, Cooking, (Victorian), per case ...	6s. to 9s.
Apricots, per quarter-case ...	...
Bananas (Cavendish), per dozen ...	$2\frac{1}{2}$d. to 6d.
Bananas (Sugar), per dozen ...	2d. to $3\frac{1}{2}$d.
Cherries, per case ...	...
Cocoanuts, per sack ...	12s. to 15s.
Custard Apples, per quarter-case ...	...
Lemons (Lisbon), Local, per case ...	3s. to 6s. 6d.
Lemons (Italian), per case ...	21s. to 22s.
Mandarins, per half-case ...	...
Mangoes, per case ...	2s. 6d. to 5s. 6d.
Nectarines, per quarter-case ...	6s. to 9s.
Oranges (Navel), per case ...	17s. to 18s.
Oranges (other), Italian and American, per case ...	17s. 6d. to 20s.
Papaw Apples, per quarter-case ...	1s. 6d. to 4s.
Passion Fruit, per case ...	3s. 6d to 7s. 6d.
Peaches, per case ...	4s. to 8s. 6d.
Pears (Local), per case ...	9s. to 11s.
Peanuts, per pound ...	4d. to $4\frac{1}{2}$d.
Persimmons, per quarter-case ...	3s. to 5s.
Plums, per case ...	8s. 6d. to 10s.
Pineapples (Ripleys), per dozen ...	4s. to 8s.
Pineapples (Rough), per dozen ...	9d. to 3s. 3d.
Pineapples (Smooth), per dozen ...	3s. to 5s.
Rockmelons, per dozen ...	1s. 6d. to 4s.
Rosellas, per sugar bag ...	...
Strawberries, per dozen pint boxes ...	...
Tomatoes, per quarter-case ...	1s. 6d. to 4s.
Watermelons, per dozen ...	...

TOP PRICES, ENOGGERA YARDS, JANUARY, 1916.

Animal.	JANUARY. Prices.
Bullocks	£20 7s. 6d. to £27 10s.
Bullocks (Single)	...
Cows	£15 to £17 17s. 6d.
Merino Wethers	48s. 9d.
Crossbred Wethers	54s.
Merino Ewes	34s. 3d.
Crossbred Ewes	52s. 6d.
Lambs	38s. 9d.
Pigs (Porkers)	71s.

LONDON QUOTATIONS.

London, 12th February.—Danish butter is quoted at 158s. to 162s. per cwt.

The market for frozen rabbits is dull, and prices are unchanged.

Hides are very firm. Queensland meatworks, 50-60 lb. are quoted at 11⅛d.; 40-50 lb., 10⅝d; 30-40 lb., 10⅜d. New South Wales meatworks, 11⅜d., 10⅞d., and 10 7·16d.

Leather is in good demand. Best Sydney is quoted at 17d. to 19½d.

Basils are in good demand owing to shorter supplies, and some inquiry for Government work. First Sydney, 14d. to 15½d.; New Zealand, 16d. to 18d.

The Liverpool quotation for middling American cotton, February-April shipment, is 7·81d. per lb.

Jute, native, first marks, February-March shipment, from Calcutta, £31 5s. per ton.

Hemp, high point, fair, New Zealand, February-April shipment, £47 per ton.

Mexican sisal hemp, £46 10s. per ton.

Rubber, fine, hard Para, 3s. 2¾d. per lb.; plantation, first latex crepe, 3s. 5½d.; smoked sheet, 3s. 4¾d.

Copra, South Sea, January-February shipment, £34 10s. per ton.

Raw linseed oil, spot pipes, £44 per ton.

The present value of Mexican sisal fibre is equal to about £46 10s. per ton, but exorbitant rates of freight render its import into Europe impossible.

Mauritius hemp (Furcrea) is quoted at from £35 for fair to £37 for prime.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Re-cords.	Jan., 1916.	Jan., 1915.
North Coast.	In.		In.	In.
Atherton	14·97	13	7·64	2·56
Cairns	18·83	27	32·01	3·29
Cardwell	17·54	27	18·37	10·02
Cooktown	15·24	27	16·32	8·19
Herberton	10·49	27	5·50	0·90
Ingham	16·95	22	21·08	13·95
Innisfail	25·28	27	22·33	7·97
Mossman	22·71	5	21·66	6·32
Townsville	13·70	30	9·89	9·33
Central Coast.				
Ayr	12·11	27	5·66	2·12
Bowen	11·05	27	7·76	0·34
Charters Towers ...	6·45	27	1·85	1·58
Mackay	15·73	27	9·25	2·94
Proserpine	18·23	11	8·71	1·02
St. Lawrence ...	11·23	27	0·41	1·73
South Coast.				
Biggenden	5·18	14	0 76	3·23
Bundaberg	10·62	27	1·30	3·86
Brisbane	6·45	65	2·34	2·11
Childers	9·01	19	1·39	2·43
Crohamhurst ...	13·44	22	3·71	5·78
Esk	5·71	27	1·54	5·43
Gayndah	5·76	27	0·62	5·59
Gympie	7·55	27	4·02	4 97
Glasshouse M'tains	10·09	6	3·48	8·66
Kilkivan	6·49	27	1·68	3·10
Maryborough ...	8·33	27	1·82	3·39

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Re-cords.	Jan., 1916.	Jan., 1915.
South Coast—continued:	In.		In.	In.
Nanango	4·78	27	2·36	2·15
Rockhampton ...	9·54	27	0·39	4·26
Woodford	7·40	27	4·42	2·78
Yandina	10·45	21	4·61	6·23
Darling Downs.				
Dalby	3·75	27	3·59	2·40
Emu Vale	3·32	17	2·25	3·83
Jimbour	4·13	24	2·20	1·90
Miles	4·17	27	3·52	0·38
Stanthorpe ...	4·16	27	3·39	3·36
Toowoomba ...	5·69	27	1·70	2·33
Warwick	3·89	27	2·60	1·74
Maranoa.				
Roma	3·77	25	1·67	0·43
State Farms, &c.				
Gatton College ...	4·48	14	2·04	2·42
Gindie	3·82	13	2·37	0·06
Kamerunga Nurs'y	17·98	23	32·15	2·73
Kairi	8·36	3	10·08	3·96
Sugar Experiment Station, Mackay	14·70	16	7·56	1·96
Bungeworgorai ...	0·58	3	0·55	0·27
Warren	1·00	3	0·16	2·08
Hermitage ...	2·71	7	2·99	1·92

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year and for the same period of 1915, having been compiled from telegraphic reports are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE FIRST FOUR MONTHS OF 1916.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·58	5·46
2	4·57	6·45	5·21	6·42	5·42	6·18	5·59	5·45
3	4·58	6·45	5·22	6·41	5 43	6·17	5·59	5·44
4	4·58	6·45	5·22	6·41	5·43	6·16	6·0	5·43
5	4·59	6·45	5·23	6·40	5·44	6·15	6·0	5·42
6	5·0	6·46	5·23	6·39	5·45	6·14	6·1	5·40
7	5·0	6·46	5·24	6·39	5·45	6·13	6·1	5·39
8	5·1	6·46	5·25	6·38	5·46	6·12	6·2	5·38
9	5·1	6·46	5·26	6·37	5·46	6·11	6·2	5·37
10	5·2	6·46	5·27	6·37	5·47	6·10	6·3	5·36
11	5·3	6·46	5·27	6·36	5·47	6·9	6·3	5·35
12	5·4	6·46	5·28	6·35	5·48	6·8	6·4	5·31
13	5·5	6·46	5·29	6·35	5·48	6·7	6·4	5·33
14	5·6	6·46	5·30	6·34	5·49	6·6	6·5	5·32
15	5·7	6·46	5·30	6·33	5·49	6·5	6·5	5·31
16	5·8	6·46	5·31	6·32	5·50	6·4	6·6	5·30
17	5·8	6·47	5·32	6·31	5·50	6·2	6·6	5·29
18	5·9	6·47	5·32	6·31	5·51	6·1	6·7	5·28
19	5·9	6·47	5·33	6·30	5·51	6·0	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·8	5·26
21	5·11	6·46	5·34	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·35	6·27	5·53	5·57	6·8	5·24
23	5·13	6·45	5·36	6·26	5·53	5·56	6·9	5·24
24	5·13	6·45	5·37	6·25	5·54	5·55	6 9	5·23
25	5·14	6·45	5·38	6·24	5·54	5·53	6·10	5·22
26	5·15	6·45	5·38	6·23	5·55	5·52	6·10	5·21
27	5·16	6·44	5·39	6·22	5·55	5·51	6·11	5·20
28	5·17	6·44	5·40	6·21	5·56	5·50	6·11	5·19
29	5·18	6·44	5·41	6·20	5·57	5·49	6·12	5·18
30	5·19	6·43	...	...	5·57	5·48	6·12	5·18
31	5·20	6·43	...	...	5·58	5·47	...	...

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H. M.
5 Jan.	●	New Moon	2 45 p.m.
12 ,,	☾	First Quarter	1 38 ,,
20 ,,	○	Full Moon	6 29 ,,
28 ,,	☽	Last Quarter	10 35 a.m.

The moon will be partially eclipsed between 6 p.m. and 7·24 p.m. on January 20th. It will be at its nearest to the earth on the 4th at midnight, and at its greatest distance on the 17th at 3 p.m.

4 Feb.	●	New Moon	2 6 a.m.
11 ,,	☾	First Quarter	8 20 a.m.
19 ,,	○	Full Moon	12 29 p.m.
26 ,,	☽	Last Quarter	7 24 p.m.

The moon will be at its nearest to the earth on the 2nd at 10 a.m., and at its farthest on the 14th at 7 a m. It will pass very close to the Pleiades on the 11th about midnight.

4 Mar.	●	New Moon	1 58 p.m.
12 ,,	☾	First Quarter	4 33 a.m.
20 ,,	○	Full Moon	3 27 ,,
27 ,,	☽	Last Quarter	2 22 ,,

The moon will be farthest from the earth on the 13th at 3 a.m , and nearest on the 26th at 11 p.m. It will pass over and occult the bright star, Antares, on the 25th between 4 a.m. and 5 a.m.

3 Apr.	●	New Moon	2 21 a.m.
11 ,,	☾	First Quarter	12 36 a.m.
18 ,,	○	Full Moon	3 7 p.m.
25 ,,	☽	Last Quarter	8 38 a.m.

The moon will be farthest from the earth on the 9th at about midnight, and at its nearest on the 21st at 9·36 p.m. It will be near the planet Neptune on the 11th at 7·30 p m., but a good glass will be necessary to see the planet which will be rather more than the width of the moon to the south.

A total Eclipse of the Sun will occur on Feb. 3rd, visible in parts of Central and South America, in parts of the Pacific and Atlantic Oceans, and partially only in Great Britain, France, Spain, &c.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 17 m., 28 m., 36 m., and 47 minutes, respectively, later than at Brisbane at this time of the year.

At Roma 15 minutes may be added to the Brisbane times for January and February, and about 17 minutes for March and April.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light sandy soil the wheat should be rolled. On sticky land it should only be

rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SEED WHEAT FOR FARMERS.

The Government's scheme for providing farmers with seed wheat was well advanced during the past month. It had been estimated by the Department of Agriculture and Stock that the requirements would be about 60,000 bushels, but up to the last date on which applications for seed could be accepted (15th March), 70,000 bushels had been applied for. The Minister for Agriculture (Hon. W. Lennon) who in the middle of March paid a visit to the grading establishment at Toowoomba, stated on his return that he is highly gratified at the quality of wheat that is being graded for seed purposes. The methods that are being adopted he thinks are as nearly perfect as can be made, and provide an interesting exhibition of the work of machinery when controlled by brains. Mr. Lennon expects that the applications will necessitate about 70,000 bushels of seed wheat being distributed. Large quantities already have been

distributed. Unfortunately, owing to the very dry season in 1915, the wheat generally was poor and pinched, consequently there is a large proportion of "seconds," or chick wheat, which is being sold at reduced prices, and for which there is a satisfactory sale. Mr. Lennon, referring to the prices to be charged for seed wheat, said it was proposed to add together the purchasing price of the wheat and the total expenditure incurred in storing, handling, cleaning, and delivering of it, and then to strike a flat rate which would just cover the outlay and expenses. It was not proposed, he said, to make any profit at all on the transaction, but to charge just sufficient to meet the total cost to the department. Referring generally to the seed wheat distribution scheme, he said he thought the department was doing a really good work for the State, and personally he thought it was just as important to see that the farmer was supplied with properly-graded wheat as it was to seek to improve the breeds of stock for the stock breeder. Several varieties of approved rust-resisting wheats are being handled, and Mr. Lennon considers that the seed that is being distributed is of the very finest quality.

CHICORY IN SOUTH AUSTRALIA.

The "Journal of Agriculture of South Australia" stated in November last year that "The chicory industry has languished in the Rendelsham (Millicent) district (S.A.) because the growers have allotted to outside speculators the performance of a very necessary part of the work which might have been easily done by themselves. A movement has now been launched with a view of erecting kilns and buildings to convert the raw chicory into the finished product before it leaves the growers' hands, and to enable the producers to deal direct with the coffee blenders."

Last month, by the courtesy of the editor of the above Journal, we received the following information on the chicory industry in South Australia. We have had several inquiries since this product was discussed in the "Q.A. Journal," as to the possibility of obtaining seed. Mr. Finnie, editor of the "S.A. Journal of Agriculture," states that a prominent seed merchant in Adelaide is prepared to supply a few pounds of seed at about 3s. 6d. per lb., but the supply is at present very short. The variety is *Cichorium Intybus,* imported from Europe.

Following notes refer to chicory-growing in the South-east of South Australia:—

Chicory is grown in the South-east only in the peat lands at Rendelsham. The area planted is limited, and depends upon the orders received from Adelaide merchants, it being the custom to place orders a season ahead.

From what I gathered in conversation with growers when in Rendelsham last Thursday (February, 1916), the ground to be planted is ploughed about the middle of August, to kill off the weeds, &c., and the seed is sown early in September, 2½ lb. of seed being used to the acre. It is sown with the ordinary onion drill in drills 7 in. apart.

The after cultivation consists only of hand weeding, as it does not do to disturb the peat on account of its liability to drift and blow away. In fact this is one of the greatest troubles growers have to contend with. One grower informed me that he had sown twice this season, and had not a plant left. It is not spaced or thinned at all. It is generally sown in a direction in which the wind will cause the least injury, the natural lay of the land being taken into consideration.

A strip of rye is generally sown every chain or so to act as a windbreak.

Digging commences on the 1st June, three drills being placed in a row, then carted to a trough, where the tops are cut off, and the chicory washed with a rough stable broom and then bagged.

Manure (superphosphate) at the rate of 1 bag (200 lb.) to the acre is used.

About 30 to 40 acres are grown in Rendelsham every year, and the yield is about 8 to 14 tons to the acre. Portion is sent to Beachport for kiln drying, and portion is sent direct to Adelaide.

The cost of production is about as follows:—

Ground rent	£2 an acre
Seed, and putting in	15s. an acre
Harvesting	25s. to 27s. 6d. per ton

Market value, £3 7s. 6d.,* bags found, on trucks Rendelsham.

There are some hundreds of acres in the district that would grow chicory well, but the market is at present limited. I understand a movement is on foot to establish a kiln at Rendelsham with a view of finding outside markets and encouraging growers to go in more largely for this crop. It can be grown on the same land two or more years in succession, the chief difficulty being the weeds and wind, and improves the land for cereal growing, though rye and barley are the only grain crops that grow well in the peat land.

I think there is no special variety of chicory grown, though I overlooked that point when inquiring.

AGRICULTURE TAKES PRECEDENCE.

Mr. Temple Clark sends us the following extract from a farm journal:—

A favourite subject for debate in debating societies is the respective merits of agriculture, mining industry, and commerce as factors of national prosperity. There can be little doubt that in a well-organised community agriculture must rapidly take precedence and form the base and the mainstay of national prosperity. It is at least so in the United States of America, where the cereal crops are of a truly stupendous

* The price quoted is presumably for the roots as harvested, not dried, as there appears to be no drying kiln at present at Rendelsham. Averaging the yield at 11 tons, the gross value per acre would be £37 2s. 6d. Deducting expenses (less ground rents), £14 10s., the net return is approximately £22 12s. 6d.

immensity. In the season just completed, the farmers of America have obtained £1,116,000,000 worth of produce from the soil, and agriculture is the chief wealth of the country, all the vast manufacturing resources notwithstanding. The New York "Journal of Commerce" compares the crops with those for last year as under:—

	1914. Bushels.	1915. Bushels.
Wheat	891,017,000	1,002,029,000
Corn	2,672,804,000	3,026,159,000
Oats	1,141,060,000	1,517,478,000
Barley	194,953,000	236,682,000
Rye	42,779,000	44,179,000
Buckwheat	16,881,000	16,738,000
Total	4,959,494,000	5,843,265,000

As showing what immense scope there is for the development of our own agriculture it may be stated that, although the area of the two countries is about equal, the production of cereals in Australia has never exceeded 135,000,000 bushels, against the 5,843,000,000 of the United States.

COTTON.

The first statistical information of cotton in Queensland is for the year 1860, when 14 acres were under crop. A civil war in America gave great impetus to the cultivation of it under the plantation system, and the Government of the day fostered it by a bonus on exported cotton varying from £10 to £2 10s. for each bale of ginned cotton of 400 lb. in weight.

In 1870 there were 14,674 acres under crop, and in 1871 6,505 bales were exported. The highest price obtained for raw cotton was in 1864, when 2s. 2¼d. per lb. was secured in Liverpool, and the total bonus paid in that year was £84,868. Owing to the cessation of the bonus and the resumption of the export trade by America, cultivation declined annually from 1870, until in 1887, when there was no area under crop.

The second period of cotton-growing was between 1890 and 1897, when the Ipswich Cotton Company was established and encouraged by a bonus for the first 5,000 yards of cotton goods manufactured. The company secured the bonus but afterwards went into liquidation.

The third period commenced with the drought of 1902, when this department advocated cotton as a subsidiary crop on the farm to serve the double purpose of producing a marketable article, and, as it is a drought-resisting plant, to serve as fodder for cattle at that time. The crop was taken by the department and sold on owners' account, the growers receiving 5·9d. per lb. for the raw cotton, which was sold in Australia.

Following this revival, the firm of Joyce Brothers purchased the Ipswich Cotton Mills and continued to work them until 1912, when they

were compelled to close down owing to the competition of the imported article. But few lines of cotton goods were made at Ipswich, and the several applications to the Commonwealth Government by the firm for assistance in one form or another to compete with the imported goods received no encouragement.

The position of the industry was therefore, in 1913, again in a critical state, and to save it, and possibly to encourage the expansion of it, the Government again entered the field and offered to take all raw cotton and to make an advance thereon of 1½d. per lb. The raw cotton was received and ginned at this department and sold, the return to the growers being equal to about 1¾d. per lb. The process was repeated during 1914-15, the crop from which, owing to the war, has not yet been sold, and for the crop that is now maturing the grants to farmers have been raised to 1¾d. It is proposed, as soon as circumstances allow, to send ginned cotton, which amounts to the ginning of two years, to Europe to really test what the market value of the average cotton grown here is worth.

Cotton as a subsidiary crop on the farm should be a valuable by-product to the farmer because, in addition to producing a marketable article, it is a plant that withstands dry weather and is good feed for cattle.

It is quite understood that the large plantation days have passed, but there is no reason why each farmer should not cultivate an acre or a few acres of this profitable crop.

Apart from what has been said of the acts of the department, much information has been supplied to those who contemplate or made inquiry concerning the matter, and persons have been engaged to go amongst the growers to advocate its cultivation; but the knowledge of the preceding failures makes it probable that the resuscitation of it will be attained by degrees.

It may be stated that the requests for a supply of cotton seed by farmers all over the State during the past twelve months have been numerous. The department has, however, made arrangements for the importation of a quantity of seed of the best three varieties of cotton grown in the United States, and this is expected to arrive in Brisbane not later than September next, or even earlier, which will be in plenty of time for sowing for a 1916-1917 crop. The seed will be distributed to *bonâ fide* applicants. The quantity imported will be sufficient to put 1,000 acres at least under cotton, and putting the minimum yield of that area at 1,000 lb. of seed cotton, the immediate cash return to the grower, at the price fixed by the department of 1¾d. per lb., will amount to about £7 5s. Deducting ½d. per lb. for picking (£2 1s. 8d.) the immediate net return would be about £5 3s. 4d. per acre, and to this would be added all profits made over and above the cost of ginning, baling, freight, &c. Considering that the minimum yield may be 1,000 lb. of seed cotton per acre, the return would amount to 1,000,000 lb., worth, at 1¾d. per lb., roughly £7,290, all of which will go into the farmers' pockets, plus any profit on sales made by the department.

Pastoral.

FARMERS' SHEEP IN THE BURNETT DISTRICT.

By "BRINY."

As is well-known, a great number of sheep were at one time run over the Burnett district.

The country was found to be unsuitable to the conditions under which sheep were then run, and cattle took their place on the stations into which the district was in those days divided. It is difficult to obtain much authentic information about the sheep of those early times, and to anyone in search of such the statements given are generally of a very vague and of a hearsay character. It is certain, however, that sheep did not do well, and speargrass and foot rot are the most general reasons given for their failure.

The object of this article is to give a concise account of the efforts made by selectors during the last twelve years to establish sheep on small forest areas under the latter-day much altered conditions in the Burnett district. (Forest is here particularly mentioned as distinct from the scrub areas.)

The results of all of these several selectors' attempts were more or less failures, and in some cases disastrous; nevertheless, from among the ruins of their efforts much valuable material may be obtained on which to base opinions for guidance in the future.

At the outset the writer would like to point out that, although it is fully given as a reason to-day, worm trouble was never mentioned ten years ago as a cause of sheep leaving the Burnett in the early days, and in the writer's opinion worms cannot then have been such an all-pervading factor in the exodus of the sheep as has been the case in this more recent effort, some particulars of which are given later in this article.

The town of Gayndah was established during the sheep days, and the wool teams for many years formed the greatest part of the traffic on the Gayndah to Maryborough road. The ruins of woolsheds may still be seen on the stations, and these, together with the raised square mounds (a one-time night yard) and ruins of a hut with which, in conjunction, the district is studded, all go to show that sheep were for some years well established in the Burnett.

The writer, about ten years ago, on several occasions conversed with old shepherds of those early days, and they could not recall any experiences with either worms or fluke, nor have other "old timers" conversed with—station hands of the early days—been able to call to mind worm troubles among the sheep. Certainly, the sheep were never drenched. Worms probably were present, and were possibly at

times an unrecognised cause of mild trouble; but it is certain—and later experience confirms this—that under conditions of shepherding over large areas in which sheep were then kept they were not affected with worms to anything like the disastrous extent that they were infected when kept under the conditions of being paddocked in small areas, heavily stocked, as they were kept during this latter period I now write of.

It seems certain that sheep left the Burnett because it was found impossible to shepherd them profitably in country ever increasing in speargrass; and this, in conjunction with the fact that at about that time the Western country was opened up for sheep, caused the sheep to quickly leave the Burnett for more profitable conditions. It is the writer's wish to show that the later settlers in trying, through subdivision and stocking, to make conditions for speargrass seed impossible, really created a condition most favourable for worm troubles which sheep in the early days, through not being restricted to small areas, did not experience, and also to show that both speargrass and worm troubles may, with proper precautions, at the same time be avoided.

It must first be shown that there is a very limited quantity of sheep feed in the forest pastures of the Burnett, and that sheep when allowed to pick and choose over a large area, or when confined in paddocks very lightly stocked with sheep, will keep free from worms and do well, and that if their forest feed is supplemented with a little other, such as lucerne, they will do very well indeed.

During the great drought of 1902 many sheep were travelled to the Burnett for relief country, amongst other parts to the Degilbo district. The drovers found that the sheep did well, worms were not complained of, and of speargrass and foot rot there was none.

Noticing this, a selector at Didcot, an experienced sheep man, stocked his selection with sheep. These appeared to do well for two or three years; speargrass was a little trouble, but sheep were during that time never drenched for worms, nor were there losses due to worms. This selector reared lambs successfully, and increased his flock by this means and by purchases. The object throughout was to heavily stock and to keep the grass well hammered, to effect the dual purpose of ridding the place of speargrass and to also provide that short bite for the sheep such as, in conjunction with other favourable conditions, they thrive on.

When this selector, through increase of his flock and subdivision, was able to attain, in these respects, his object, his sheep became worm-infested, and to such an extent that they must have been highly unprofitable.

On the strength of this first selector's early success a dairy farmer, who had some small experience with sheep, purchased 100 crossbred weaners of mixed sexes and heavily stocked a small paddock. In a very short time these sheep were highly infested with worms, and in spite of continual drenching the losses were heavy. A few years later

this same farmer purchased more sheep (Merino wethers), and by running them on the forest and supplementing their feed with a little lucerne and, I believe, paspalum, he found them very profitable.

Another case may be mentioned in which 1,000 Comeback ewes were introduced. These were just 8-tooth. They were shepherded for seven months over country which had been previously burnt. During this time, although carefully watched, they showed no signs of worms, and they were never drenched.

They were then confined in a 320-acre paddock, the intention being to eat it out, and after burning change them to another. They, however, soon showed symptoms of worms, and had thereafter to be continually drenched.

After being six months in paddocks, 350 of the poorest of these sheep were travelled to the Darling Downs. So poor and worm-ridden were they that the owner was much criticised for even starting them. They, however, improved from the outset, and this in spite of the fact that the greater part of the route lies through sheep-condemned country. So greatly had they improved that they were sold on arrival at 3s. in advance of their original cost in the same state of wool.

Two sheep from this flock escaped into some thousands of acres of open country—Crown land—used as relief country by dairy farmers of the district. It was therefore heavily stocked with cattle, and consequently free from speargrass. These sheep were found and run down months later and were rolling fat. Clearly they had suffered from neither speargrass nor worms.

One other instance I will give of some purebred Leicester ewes and Merino ewes introduced near Gayndah. These were run in small paddocks heavily stocked and did no better than the rest.

It has been shown, then, in the cases quoted that sheep travelled over roads of the Burnett district during drought time after these roads have been previously heavily fed off by cattle have invariably done well, because they have moved over fresh country daily, and the sheep have been able to pick and choose.

And sheep travelled over roads in good seasons and shepherded in good seasons have also done well in the Burnett for the same reason.

Sheep confined in small areas and heavily stocked no doubt, also, at first pick and choose and do all right, but their choice is limited, and they soon are compelled to eat that bulky coarse growth on which they cannot thrive. They fall away in condition, and their weakened constitutions are unable to resist the ravages of worms, for whom, we are told, it is natural in limited numbers that they should be the hosts.

Sheep brought into the Burnett and shepherded over a restricted area, although on burnt feed about 3 inches high, will never camp. They travel from daylight until dark looking for that which they are unable to find in sufficient quantity; and that they then start to chew

the cud is induced more by the restraints of the night yard than to that well-filled, contented condition such as they would have attained in a few hours on equally well-grassed sheep country.

It may be argued that sheep shepherded over a large area do not infect it so heavily with worms as they would do if the same number were confined in a much smaller area, and also that sheep travelled over fresh country roads are unable to pick up the parasites with which they may have infested the country behind them. And no doubt this would be true; but we find cattle subject to the same stomach worm, and when, through overstocking and in time of drought, we see an emaciated steer with a swelling under its jaw, it is not because this beast or its mates have more heavily infested the paddock with worms, but rather because the beast has been unable to attain from the scant and unsuitable food available sufficient to nourish and keep up its constitution during its growing period, and it thus, like the sheep and for the same reasons, becomes infested with worms. The difference is that cattle normally thrive on the long rank grasses of the coastal areas; sheep will thrive only on the most succulent shoots of these grasses and on the couch grass and small quantity of herbage which grows amongst them. The sheep in the first example quoted at the beginning of this article evidently did well enough until, through breeding and purchases and subdivision, the country became too heavily stocked to enable the sheep to sufficiently discriminate in their feed. In the third instance given, although sheep were first a failure, when Merino wethers were run on the same country and their feed was supplemented with a little lucerne and paspalum, worm trouble did not appear and the sheep were sold as fats.

A well-nourished calf, reared on its mother, does not suffer with worms, yet how many poorly nourished poddie calves die of worms yearly. And the sheep may well be compared along with the poddie calf in this respect—that if they are well nourished there will be no need to drench them for worms. So good results did the writer obtain from giving a few sheep half-a-pint of corn each daily that he extended the experiment and stocked a 60-acre paddock heavily with wormy sheep, and daily a certain six of these sheep were fed with a very much smaller quantity of corn, and the beneficial results were very noticeable.

It seems, then, that the solution of the difficulty is to stock the paddock with grown cattle who will eat off and thrive on the large bulk of the grass. (The couch grass and herbage is not materially diminished if judiciously fed off with grown cattle.) When the cattle have eaten as close as is profitable for them there is still ample feed for a sheep to 3 or 4 acres. The cattle will have overcome the spear-grass difficulty and a sheep will find remaining on the 3 or 4 acres all the feed it may require. This, then, leads us a step further, for in the well-conditioned sheep the fleece is full of yolk, and this soapy substance congeals on any speargrass there may be in the wool and so destroys its nature that if there is any length in the wool the seed loses its

power to penetrate further. Therefore, condition is not only a preventive against worms, but is also a great help against a reasonable quantity of speargrass.

Much has been claimed for salt as a preventive for worms in sheep, and for a salt and turpentine lick. The writer has found that, although access to salt is good for sheep, 900 sheep will clean up as much as 4 gallons of coarse salt in a night without any beneficial results, as regards worms, over a period. If turpentine is added, the sheep will eat less, but there is no improvement in the result.

A good deal has been said of the unsuitableness of the Merino breed as introduced in the early days. In the Burnett, amongst the instances given there have been kept Lincolns, Leicesters, Crossbreds, Romney Marsh and pure Merino, and the longwools and crossbred made, I believe, the poorest showing of the lot. The Romneys introduced were rising 2-tooth, and as such, in view of what has been done with this breed in other parts, cannot be considered a fair trial. The writer does not here wish to argue that the longwools are not more suited to a wet district, but rather that the district mentioned is not a wet one in a sense as should be applied to these breeds. There are heavy wet spells, but the prevailing conditions are dry, and the number of wet days in the year comparatively few.

The crossbred cannot live alongside the Merino in hard, dry country, and being difficult to get and more expensive, the farmer may consider it better to select large-framed Merino ewes, and if a Romney or long-wooled ram is used, there will be a profitable fleece in the flock and crossbred lambs for the market.

It will be noticed that throughout this article sheep on forest areas only have been dealt with. Sheep at the present time are being successfully run on the artificial grasses on the scrub lands of the old Degilbo run, and their full-blooded eyes and lean jaws show they will do as well on this artificial pasture in the Burnett as they will on artificial grasses or crops of the forest, and these remarks cannot apply to them. The problem to solve has been how to succeed with sheep on the forest grasses.

In conclusion, I would like to point out this article is not written as a scientific treatise on worms in sheep, but it is rather the observations of a bushman experienced with sheep, and who has had sheep in the Burnett and has watched them pretty closely while he had them.

[Mr. W. G. Brown, sheep and wool instructor, Department of Agriculture and Stock, to whom the above article was submitted, writes:—"The above article on 'Sheep in the Burnett' is very interesting. For one reason, it is so difficult to get any authentic information as to the experiences of the sheep-farmers of, say, forty years ago; and, for another, the opinions expressed in it tally in great measure with such information as I have been able to collect. As to the questions raised, I propose to comment on one or two of them in future issues of the Journal, not in a spirit of controversy, but to supplement 'Briny's' clear and interesting article."]

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF FEBRUARY, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Melta	Holstein	17 Dec., 1915	1,070	3·8	47·68	
Madam Melba	,, ...	28 Oct. ,,	782	4·0	36·72	
Burton's Lady	Shorthorn ...	13 Jan., 1916	721	4·0	33·86	
Miss Melba	Holstein	30 Sept., 1915	700	3·9	32·04	
Miss Bell ...	Jersey	8 Sept. ,,	491	5·5	31·93	
Burton's Lily	Shorthorn	13 Jan., 1916	673	4·0	31·60	
Violette's Peer's Girl	Jersey	8 Dec., 1915	542	4·9	31·32	
Sweet Meadows	,, ...	28 Sept. ,,	429	6·0	30·69	
Lady Margaret	Ayrshire	14 Oct. ,,	563	4·6	30·51	
Miss Edition	Jersey	27 Sept. ,,	479	4·9	27·66	
Lady's Maid	Shorthorn... ...	26 Jan., 1916	580	4·0	27·24	
Mistress Bee	Jersey	21 Jan. ,,	497	4·6	26·84	
Lady Twylish	,, ...	5 June, 1915	402	5·4	25·66	
Twylish's Maid	,, ...	22 Oct. ,,	440	5·0	24·96	
Noble Dot ...	,, ...	2 May ,,	387	5·4	24·69	
Gretchen ..	Holstein	16 Aug. ,,	551	3·8	24·54	
Constancy ...	Ayrshire	24 Nov. ,,	469	4·4	24·28	
La Hurette Hope	Jersey	17 Nov. ,,	427	4·8	24·16	
Bella ...	Ayrshire	25 Dec. ,,	506	4·0	23·77	
Special Edition	Jersey	1 Nov. ,,	427	4·7	23·60	
Iron Plate ...	,, ...	20 Jan., 1916	432	4·5	22·89	
Rosine ...	Ayrshire	7 Aug., 1915	509	3·8	22·68	
Netherton Belle	,, ...	23 April ,,	396	4·7	21·83	
Dottie .	Shorthorn.. ..	27 Nov. ,,	399	4·6	21·67	
Daisy ...	Holstein	23 Nov. ,,	495	3·7	21·54	
Simple Interest 9 h	Jersey	22 Oct. ,,	372	4·9	21·49	
Silver Nell ...	Shorthorn	16 Aug. ,,	413	4·5	21·09	
Lucinda ...	Ayrshire	14 Oct. ,,	470	3·9	20·93	
Rosebud II.	,, ...	11 Oct. ,,	458	3·8	20·39	
Bluebell ...	Jersey	20 June ,,	360	4·8	20·37	
Dolly ..	Shorthorn... ...	23 Jan. ,,	359	4·8	20·29	
Miss Jean ...	Ayrshire	5 Nov. ,,	430	4·0	20·19	
Mischief ...	,, ...	27 Sept. ,,	465	3·7	20·14	
Jeannie ...	,, ...	7 Aug. ,,	439	3·9	20·09	
Lady Spec.	,, ...	6 Jan., 1916	438	3·9	20·00	

In addition to such natural pasture as was available, the cows received a daily ration of oaten chaff, lucerne chaff, and bran.

TO MAKE CHEESE IN A SMALL WAY.

Some time ago, a pamphlet (now out of print) was issued by the Department of Agriculture under the title of "Papers for the People by Practical Men." Amongst these papers was one by Mr. Baron Jones, then manager of No. 1 Travelling Dairy, entitled "Cheese-making Simplified," and the directions therein given were as follows:—

"It has often been remarked by visitors to the travelling dairy that the cheese-making plant is on too extensive a scale for a small farmer to entertain. In order to show the simplicity with which cheese can be made, the pupils of the travelling dairy are instructed in a simple method of making cheese at their own homes by using two ordinary washing tubs in place of a large cheese vat which forms part of the dairy plant. The operation is performed in the following manner:—For a cheese of 10 lb. take about 3 gallons of night's milk, which must be put in small dishes until morning and kept *thoroughly sweet;* then having two tubs ready, one being sufficiently large to contain the other, leaving a space for water between them, place a strainer cloth over the inner tub, then pour in the 3 gallons of night's milk without removing the cream. to which add 7 gallons of morning's milk fresh from the cow. In the outer tub add sufficient water to raise the whole mass to a temperature of 84 degrees Fahr. At this stage about 4 drachms of Barnekow's Annatto or colouring matter should be added and thoroughly stirred in. after which 8 drachms of Barnekow's rennet. mixed with about a pint of cold water, should be also added, stirring thoroughly so as to mix evenly through the milk. The stirring should not be continued more than 1 minute; the milk being allowed to come to a perfect rest, and remain stationary for 40 minutes, when the curd will be of a sufficiently firm consistency to cut, which can be accomplished in the following manner:—Tie together firmly by the handles two or three ordinary carving knives; draw these so as to cut the curd into squares. After which gently turn these squares of curd so as to present the flat surface to the top; the knives may then be again drawn through, cutting the curd into small cubes or dies of about ½-inch. After allowing the curd to rest for a few minutes, warm water should be let in between the two tubs in sufficient quantities to raise the temperature of the curds and whey to 100 degrees Fahr., taking about 1 hour in doing so; the whole mass being gently stirred during this time to prevent any of the curd from packing together or adhering to the side or bottom of the tub, and to distribute the heat as evenly as possible throughout the entire bulk. The next stage is the most important in the whole process, as upon its being properly carried out depends the whole character of the cheese. Great care in acquiring the taste necessary for ascertaining the proper time for removing the

curds and whey is required, as, should the whey be allowed to become in the least sour, the cheese will be spoiled; and, on the other hand, if it is removed while sweet the cheese will not keep sufficiently long to mature. As an indication that the whey has been withdrawn too late from the curd, the cheese after being removed from the press will in a few hours become quite moist and inclined to run a watery substance, not drying or forming a rind as of a properly made cheese. It is necessary to keep the curds and whey at or near this temperature of 100 degrees Fahr. until the whey is *on the point of turning sour,* when the inner tub should be immediately removed from the one containing the water, and, after pouring off the latter, take a piece of cheese-strainer cloth and tie it over the empty tub, pouring the curds and whey in the cloth, the whey running through the latter whilst the curd remains in it. Gently stir the curd to prevent packing and running together, and, after allowing it to cool for a short time, finely powdered salt may be added at the rate of 4 oz. to the 10 gallons of milk used. In half-an-hour the salted curd will be sufficiently cool to be placed in a mould, which is a circular galvanised hoop (perfectly smooth inside and open at both ends) 12 inches high, having a diameter of 7 inches, with a wooden lid or follower fitting closely into it. The mould containing the cheese should have a square block of wood (placed on top of the closely-fitting follower) of sufficient depth so as to be an inch or so above the top. This should then be placed under the press, which is made as follows:—In any well-shaded position from the sun, nail two upright battenings (3 by 1) about 2¼ inches apart, with narrow edges facing position of intended lever lengthwise. In these battenings bore ½-inch holes diagonally, beginning at 11 inches from the floor and working upwards. Then secure the battenings to a veranda post or any other firmly fixed upright. Then take 10 feet of 2 by 3 quartering, boring ½-inch hole 3 inches from one end, which place between the battenings, putting a ½-inch bolt through the two battenings and quartering, thus forming a lever that will not twist sideways. Place the mould containing the cheese under the lever about 1 foot from the uprights, then put the block on the follower and allow the lever to come squarely on the block. The diagonal holes are made simply to allow the lever to be shifted up or down, so that it may be perfectly level when pressing on the cheese. The weight of the lever alone will be sufficient for first pressure before clothing the cheese. After remaining in the press for half-an-hour the mould containing the cheese should be removed, and the solidified mass shaken out on to a planed board. It may then be clothed in the following manner: A piece of fine muslin (called cheese bandage cloth) is sown like a bag open at both ends and slipped over the cheese, fitting closely, and cut a sufficient length to allow about 1½ inches to be neatly pleated down

on either end of the cheese; then place on the end of the cheese a circular piece of calico of sufficient circumference to allow the edges to overlap the sides of the cheese by 1½ inches, after which the mould is slipped about halfway down the clothed cheese, and both cheese and mould turned over on to an oblong (three sides of which are turned up about ¼-inch) and the other end pleated in, placing a square piece of calico sufficiently large to cover this end of the cheese (these calico cloths should be removed on taking the cheese from the press, and can be used again when required). The follower or lid is then put into position, and the mould containing the cheese put under the press, having a weight equivalent to 60 lb. on the end of the lever furthest from the cheese. On the following morning an additional weight of about 40 lb. should be added, and after 2 hours' pressing the cheese is fit to be removed from the press, and should present a smooth surface, showing that the cubes of which it is composed are perfectly amalgamated. It should then be removed to a room having a temperature of not less than 60 degrees Fahr. or above 75 degrees Fahr.; an even temperature of 67 degrees Fahr. being the most perfect for curing cheese, and of sufficient dryness to prevent the cheese turning mouldy. After being turned and wiped, say twice a day, during the first week, and once a day during the succeeding weeks, at the expiration of two months the article is fit for consumption.

The following is Mr. Baron Jones's recipe for making rennet:—

Use rennets from calves not more than eight days old. Turn these rennets inside out and wipe dry with a clean cloth; after turning back blow them out like a bladder and hang up in a dry place for 2 weeks away from fire or sun; they can then be used as follows, viz.:—Take seven rennets and cut them into strips like shoe laces; have ready boiled and thoroughly cooled 5 gallons of water, in which place the cut up rennets in a *stone* jar, adding sufficient salt to leave always a little undissolved in the bottom of the jar. Stir or rub occasionally, and in 3 or 4 days the preparation will be ready for use. One pint of the above should be sufficient to curdle 40 gallons of milk in 40 minutes. But rennets sometimes varying in strength, more or less of the preparation will be necessary to obtain the desired result, which should be arrived at in not less than 40 minutes, or more than 50 minutes. It is almost needless to add that strict cleanliness is necessary at all times in preparing this mixture. The above is simply a standard recipe; a smaller number of rennets can be used in the same proportion.

A SIMPLE CHEESE PRESS

can be made from a new oil can, a 3-foot board, and a 2 by 4 scantling 5 feet long. When the heat of the curd is reduced to 78 degrees it is ready for the press. At a higher point, the fat is liable to escape, and

if too cold, the curd particles do not adhere. Bandages are easy to make of cheese cloth. Sew a strip, the circumference and height of your tin, to a round piece of the required size. Another round piece will be needed to lie on the top of the cheese folding the wall piece down on it.

FEEDING WHEY TO CALVES.

By E. GRAHAM, Dairy Expert, and FRANK SMITH, B.Sc., Etc.

At the present time a good deal of attention is being given to the utilisation of milk for cheese-making purposes, and a considerable amount of the milk supply that was formerly devoted to butter-making purposes is now converted into cheese.

In many instances it automatically follows that this change in venue has led to an alteration in the nature of the dairy by-products used as food for calves, and young calves are reared on the dairy farms upon whey, to the exclusion of skim milk.

In order to understand the significance of this change in diet, and the influence it is capable of exercising over the dairy herds of the future, it becomes necessary to consider the relative composition and value of skim milk and whey when used as food for young calves.

Generally it is to be accepted that average milk contains approximately 87 per cent. of water, 13 per cent. of solids.

The total solids of milk may be further subdivided and set down as being 4 per cent. fat, 9 per cent. non-fatty solids (of which one-third, or 33 per cent., is casein).

In cheese-making most of the butter fat and all the casein is won from the milk. By the extraction from the milk of the butter fat and casein combined, the whole milk loses 54 per cent. of its total solids, and it follows that sweet whey contains not more than 6 per cent. of solids, which are comprised principally of milk sugar. At a glance it is to be seen that whey as a food for the calf is lacking in protein, and unless this deficiency in the amount of protein is adjusted the calf is not to be amply sustained.

However, whey is to be rendered a useful food for the purpose of feeding to calves when supplemented by certain nitrogenous meals, such as linseed meal or corn meal.

Assuming that feeding whole milk to the calf and allowing it free access to succulent pastures constitutes the ideal condition under which the young animal is to be grown, then, if success in calf raising is to be achieved, we will perforce need to fortify the whey and render it somewhat similar to whole milk in nutriment, otherwise the calf will become impoverished, its growth will be checked, its vitality lowered, and the beast rendered highly susceptible to disease, and lacking the essential

robustness of constitution and vigour that no dairy farmer can afford to incur the risk of sacrificing by conveying permanent injury to the growing animal by feeding to it a ration lacking in its full complement of nourishment. It must not be overlooked that the young heifer of to-day will be the dairy cow of the future.

Kellner estimates a calf aged from two to three months requires daily ·34 lb. protein for every 100 lb. of its live weight. Estimating the weight of the young calf at, say, 50 lb., we may consider that the animal needs ·2 lb. of protein as its daily ration.

The capacity of a calf of this weight is equal to consuming about 1½ gallons of fluid per day, and this amount of sweet whey provides ·1 lb. protein and ·9 lb. of total nutriment.

The addition to the whey of approximately one-third pound of linseed meal supplies a further ·33 lb. of digestible nutrients, raises the total nutriment to 1¼ lb., and furnishes the desired complement of protein.

Following on the above basis of a maintenance ration for the young calf, and treating more specifically with the matter of rearing calves upon a diet principally composed of whey, it is recommended that:—
For the first ten to fourteen days of its existence the calf should be fed solely upon the milk yielded by its mother, given at blood heat (100 deg. Fahr.)

For a further period of one week, ¾-gallon each of sweet whey and whole milk, mixed in equal proportions, should constitute the daily ration, afterwards the whole milk may be withheld, and the calf, aged from three to six weeks, maintained upon a daily ration of 1½ gallons of sweet whey, to which has been added 5 oz. of linseed meal. If whey is very sour at time of feeding it is advisable to add also 2 oz. maize meal or pollard.

As the calf ages beyond six weeks the addition of 4 oz. of maize meal or pollard is advisable.

The added meals should be boiled in sufficient water to make a thin gruel preparatory to their introduction to the whey, and this course is absolutely necessary in the case of feeding linseed meal, which is capable of exerting harmful influences if the boiling process is neglected.

Caution also must be taken that the linseed meal in boiling is not permitted to gather into lumps, as by this means some of the meal may be prevented from liberating its poisonous agent it is liable to contain; on this account also it is inadvisable to feed the linseed in quantity exceeding that stipulated.

All fluid matter fed to the calf should carry a temperature of 100 deg. Fahr.

The calf should be provided with clean, dry surroundings and adequate shelter, and when old enough should be allowed to graze on uncontaminated pastures, in the calf run.

The system of providing individual animals with separate drinking-bowls has in practice been found efficacious in minimising the spread of infectious ailments.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1916.

Five thousand nine hundred and sixty-two eggs were laid during the month. H. Hammill wins the monthly prize with 140 eggs. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
C. B. Bertelsmeier, S.A....	White Leghorns ...	117	1,423
J. D. Nicholson, N.S.W.	Do.	132	1,415
A. H. Padman, S.A.	Do.	133	1,404
Mrs. Munro	Do.	102	1,372
A. W. Bailey	Do.	122	1,363
J. R. Wilson	Do.	112	1,360
E. F. Dennis	Do.	110	1,353
J. M. Manson	Do.	115	1,351
J. Gosley	Do.	95	1,350
J. M. Manson	Black Orpingtons ...	113	1,348
Jas. McKay	White Leghorns ...	101	1,340
Kelvin Poultry Farm	Do.	127	1,339
W. Parker	Do.	134	1,333
King and Watson, N.S.W.	Do.	120	1,333
H. Hammill, N.S.W.	Do.	140	1,323
A. T. Coomber	Do.	123	1,321
C. Knoblauch	Do.	137	1,320
E. A. Smith	Do.	125	1,308
T. Fanning	Do.	122	1,307
O.K. Poultry Yards	Do.	104	1,301
W. Purvis, S.A.	Do.	127	1,297
Cowan Bros., N.S.W.	Do.	119	1,281
Mrs. J. Jobling, N.S.W.	Black Orpingtons ...	93	1,280
T. Fanning	Do.	110	1,277
C. T. Clark	White Leghorns ...	108	1,272
Moritz Bros., S.A.	Do.	118	1,272
E. A. Smith	Black Orpingtons ...	132	1,269
R. Burns	Do.	118	1,268
E. V. Bennett, S.A.	White Leghorns ...	103	1,266
W. Lindus, N.S.W.	Do.	129	1,259
J. H. Gill, Victoria	Do.	134	1,243
F. Clayton, N.S.W.	Do.	107	1,242
S. E. Sharpe	Do.	73	1,233
E. Le Breton	Do.	104	1,228
R. Burns	S. L. Wyandottes ...	117	1,224
Geo. Tomlinson	White Leghorns ...	122	1,222
Derrylin Poultry Farm	Do.	103	1,209
W. Meneely	Black Orpingtons ...	106	1,207
R. Jobling, N.S.W.	White Leghorns ...	103	1,201
J. G. Richter	Do	114	1,193

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
Cowan Bros., N.S.W.	Black Orpingtons ...	105	1,192
W. Lyell	White Leghorns ...	99	1,179
Loloma Poultry Farm, N.S.W.... ...	Rhode Island Reds ..	114	1,172
J. Zahl	White Leghorns (No. 1)	99	1,153
G. H. Turner	Do.	114	1,152
S. Chapman	Brown Leghorns... ...	133	1,137
J. Zahl	White Leghorns No. 2	106	1,126
J. Aitcheson	Do.	89	1,126
R. Jobling, N.S.W.	S. L. Wyandottes ...	79	1,110
E. Pocock	White Leghorns ...	99	1,095
F. Clayton, N.S.W.	Rhode Island Reds ...	119	1,083
W. H. Forsyth, N.S.W.	White Leghorns ...	98	1,068
J. R. Johnstone (five birds only) ...	Plymouth Rocks ...	84	841
Totals	...	5,962	66,341

WAR ON RATS AND MICE.

Notwithstanding the many methods of destroying rats, which we published in the February issue of this journal, further advice is asked by a correspondent. We heard last month that an entirely new material has been placed on the market by Messrs. Dalgety and Company, Brisbane, who are the sole agents for Queensland for a liquid named "Ratinol," which, it is claimed, is the best and surest rat-destroyer yet employed. The inventor is Dr. J. Christmas, M.D., of Paris and Copenhagen universities. In consideration of the splendid service his Ratinol has rendered to the French Ministry of Agriculture, the title of Officer of the Legion of Honour was conferred upon him by the French Government. Mr. J. C. Pound, Government Bacteriologist, Queensland, reporting to the Minister of Agriculture on Ratinol as an agent for destroying rats, instanced the results of two experiments made by him:—

"*Experiment* 1.—Four healthy rats were fed with pieces of bread on which a little Ratinol was sprinkled. Result: Two rats died on the first day, one on the second day, and one on the fourth day.

"*Experiment* 2.—Thirteen healthy rats were fed with a mixture of bran and pollard with a small quantity of Ratinol added. Result: Four died on the first day, one on the second day, two on the third day, four on the fourth day, and one on the fifth day.

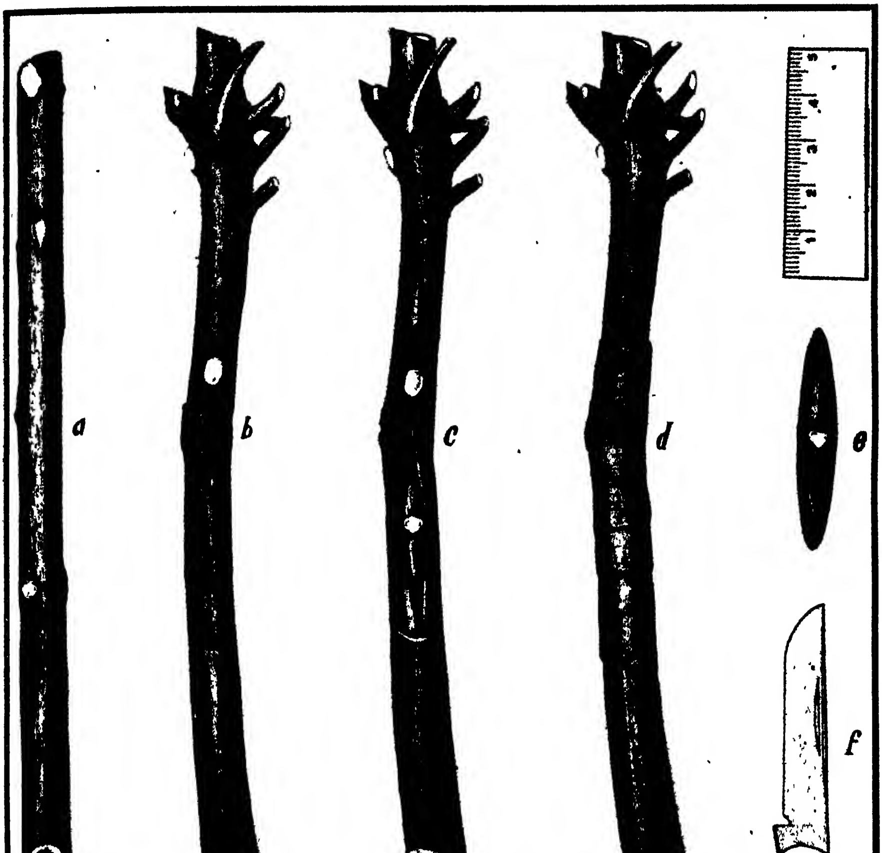
"The results of these experiments show that Ratinol can be used successfully as a means of destroying rats."

Ratinol is harmless to human beings, live-stock, dogs, cats, and birds. Analysts have found no trace of poison in it. Rats and mice eat it greedily. A small bottle of it can be bought for 2s.

The Orchard.

BUDDING THE MANGO.

We are indebted to Mr. P. J. Wester, horticulturist in charge of the Lamao Experiment Station, Lamao, Bataan, Philippine Islands, for the accompanying illustration and explanation of the process of budding the mango, as successfully adopted by him. The " formula" was published in the " Philippine Farmer":—



(*a*) Bud wood; (*b*) section of stock showing incisions made preparatory to the insertion of the bud; (*c*) bud inserted; (*d*) bud tied; (*e*) bud; (*f*) budding knife.

When mango trees are a meter (about 3 ft. 3 in.) in height they should be budded. This is not difficult, if proper precautions are observed. The first of these is to sharpen the budding knife so that it is sufficiently keen to shave the hair on one's forearm. If a budding knife

is not obtainable, grind the point of a pocket knife to the shape of the blade in the text figure.

In order that the budding operation may serve its purpose, bud wood should be taken from an old tree that is known to be productive and to bear fruit of good quality. Select from this tree bud wood that is well matured from the first, second, and third flushes from the end of the branch. This bud wood is always green and smooth.

About three weeks in advance of the date when the budding is to be performed, cut off the leaf blades of the bud wood selected. This causes the leaf stalks to drop. When scars left after the petioles have fallen are well healed, the bud wood is in condition for budding. (See illustration.)

The buds should be cut about 4 centimeters long (about 1 ⅗ in.), with an ample wood shield, and inserted in the stock at a point where the bark is green and smooth, like the bud wood, not where it is rough and brownish. Use waxed tape and cover the entire bud. When in the course of two or three weeks a good union has formed, unwind the wrapping so as to expose the leaf bud from which the growth is to issue, and cut off the top of the stock 10 to 15 centimeters above the bud.

Every ten days after unwrapping the buds go through the nursery and carefully rub off all sprouts from the stock in order to force the buds to gow. When the graft has made a growth of about 30 centimeters, cut off the stock immediately above the point of insertion of the bud.

There are yet no budded or grafted mango trees in bearing in the Philippines, but judging from the experience in other countries, it is reasonable to believe that budding or grafting process will hasten the bearing age of the mango by at least three years, if not more, and it insures the quality in all cases.

THE QUEENSLAND INDUSTRIAL GAZETTE.

We have received from the Director of Labour, Brisbane, the first number of the above Gazette (11th March), which will be published monthly hereafter, and will contain a general report of the work being done by the Labour Exchanges, and it is the intention of the Department of Labour to collect as much accurate information as possible for monthly publication, showing the exact position of the various industries throughout the State. Such a publication, replete as it is even in the first number with varied information of interest alike to employers of labour and employees, should prove a valuable addition to literature affecting all classes of the community.

Viticulture.

THE GRAPE VINE AND ITS CULTURE.

By C. ROSS, F.R.H.S., Instructor in Fruit Culture.

The grape vine adapts itself to a very wide range of soils and climate, there being very few parts of Australia, even under apparently uncongenial conditions, where certain varieties will not be found to grow and produce fruit.

It will grow on the poorest of sand and on stiff clayey soils if proper attention is paid to cultivation, drainage, manuring, &c., and will survive the coldest winters. Situations where late spring frosts are prevalent should, however, be avoided. In districts subject to excessive heat and drought, the land should always be deeply trenched or subsoiled before planting, and where the subsoil is wet and cold, artificial draining is absolutely necessary.

An ideal site for a vineyard in Southern Queensland would be a good, free, fertile, sandy loam, with natural drainage on a north-easterly aspect.

Where a due east or south-easterly aspect is chosen, it should be where there is an intervening ridge or belt of timber to break the first rays of the morning sun, which, to a great extent, will prevent the disastrous effects of late spring frosts. The same recommendation applies to other aspects subjected to cold, hot, or drying winds.

PLANTING.

The distance apart depends upon the quality of the soil and the moisture contained. If the situation is very dry and the soil weak, more room between the plants will be required, but a good average distance is 10 ft. between the rows and 6 ft. from plant to plant for trellised vines. Bush vines supported by stakes should not be less than 7 or 8 ft. apart each way. After the land has been thoroughly and deeply prepared and settled down, the simplest method of planting is with an ordinary bar used in the same manner as a dibbling stick.

PROPAGATION—CUTTINGS.

Fig. 1.—Perfect Vine Cutting.

The universal custom of propagation is by cuttings (Fig. 1) of 15 in. to 18 in. long taken from the winter prunings. The cuttings are tied in bundles and stratified

in sand in a cool place until spring. It will be found by that time that the tissue at the base of each cutting has become calloused. They are then planted to their permanent positions by inserting them in the ground to two-thirds or three-quarters of their length, leaving one or two buds exposed. Choose short-jointed cuttings in preference to those with long internodes.

GRAFTING.

FIG. 2.—Proper Scion for Cleft Graft.

Bench-grafting is now very largely employed for the prevention of the ravages of *Phylloxera vastatrix*. Cuttings of well-ripened wood of the previous summer growth are taken from American resistant stocks, or their hybrids, upon which is grafted the variety desired. The usual method adopted is either the "cleft" or the "whip tongue" graft. After being grafted, the cuttings should be stratified in sand. When calloused, they are planted out with the union well below the surface. The scions should not be furnished with more than two buds (Fig. 2), and one is sufficient for young stocks. For the first three months after vegetative activity has commenced, the soil covering the point of union should be occasionally removed and all roots emanating therefrom carefully pruned off and the soil replaced.

Many other methods of grafting and budding are employed for working over established vines of indifferent varieties, but for all practical purposes the old English "cleft" and the "whip tongue" grafts are the only two that need be discussed. In my own experience I have found the cleft to be the most successful when grafting old vines level or under ground. The operation is very simple. For instance, select a vine of any age up to twenty years. Saw off the stem above the level of the ground in midwinter (June or July), and paint the transverse section with a mixture of horse dung and clay or lime and sulphur. In August, or just before the sap is moving, the stock should be again cut back to the level of the surface. Choose a

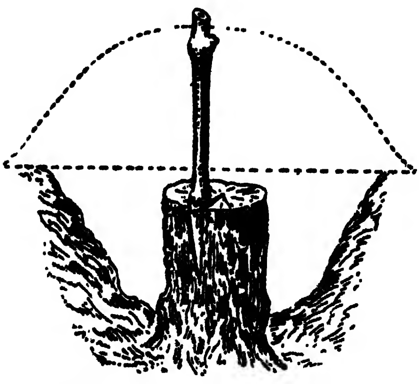


FIG. 3.—Single Cleft Graft.

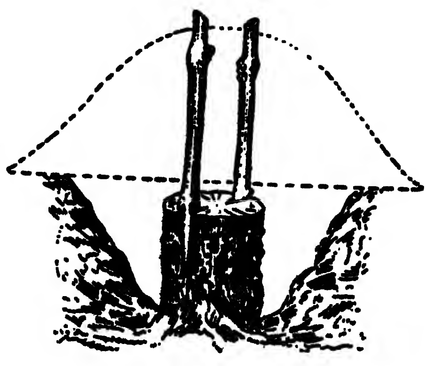


FIG. 4.—Double Cleft Graft.

backward or dormant scion, and shave it down to a wedge shape (see Fig. 2) from the base of a node down the internode; cleave the stock with a strong knife or chisel, and insert the scion down one side of the cleft. If the stock is large enough, two scions may be inserted, one on each side, bringing the inner bark or cambium layers of both stock and scion in exact juxtaposition. (See Figs. 3, 4, 5, and 6.)

FIG. 5.—Cleft-grafted Cutting—Scion with Single Bud.

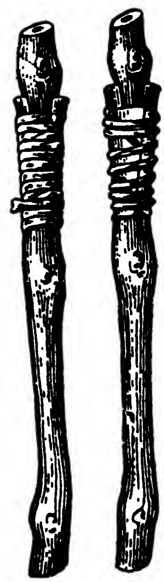


FIG. 6.—Grafted Cuttings when Ligatured.

It is always safer to bind the stock to prevent spreading. The soil is then hilled up, completely covering the scion and protecting the point of union from air and water. All surface and adventitious roots must be suppressed, and after the union has become perfect the soil may be drawn away and made level with the natural surface.

Allow the graft to make its full growth the first summer with very little pruning or pinching. Suckers, however, arising from the stock must be rigorously suppressed.

The whip tongue graft is best practised on young vines or cuttings, and is performed as follows:—The stock and scion should be of the same diameter. A clean, sloping cut is made slightly above the node of the stock, and a corresponding one below the node of the scion. The closer these cuts are made to the nodes the better, for it is near these points where most of the knitting tissue is formed, and a more perfect union is the result. (See Fig. 7.) A short parallel slit is made about a-quarter of an inch deep, corresponding in each face of the splice.

The slit is slightly opened by a turn of the knife to facilitate the insertion of the tongue. (See Fig. 8.) The larger area of cut surface thus brought into exact juxtaposition produces a greater amount of callous or knitting tissue. After being brought together, the splice is kept firmly bound with a ligature of rafia or soft twine. (See Fig. 9.)

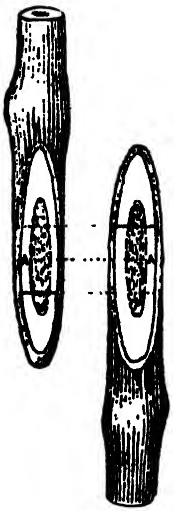


FIG. 7.—How Stock and Scion is cut for W.T. Graft. Centre dotted line shows where the slit forming to tongue is made.

FIG. 8.—Prepared Stock and Scion with tongue opened.

FIG. 9.—W.T. Graft brought together and ready for the ligature.

SHORT PRUNING.

When vines are planted out on the diagonal or square system, the gooseberry bush or goblet form of pruning is generally (Fig. 10) adopted, each vine being supported by a single stake.

FIG. 10—Goblet Pruned Vine.

After the first season the cutting will have made a growth similar to that shown in Fig. 1, Plate I. At the first pruning, all the canes

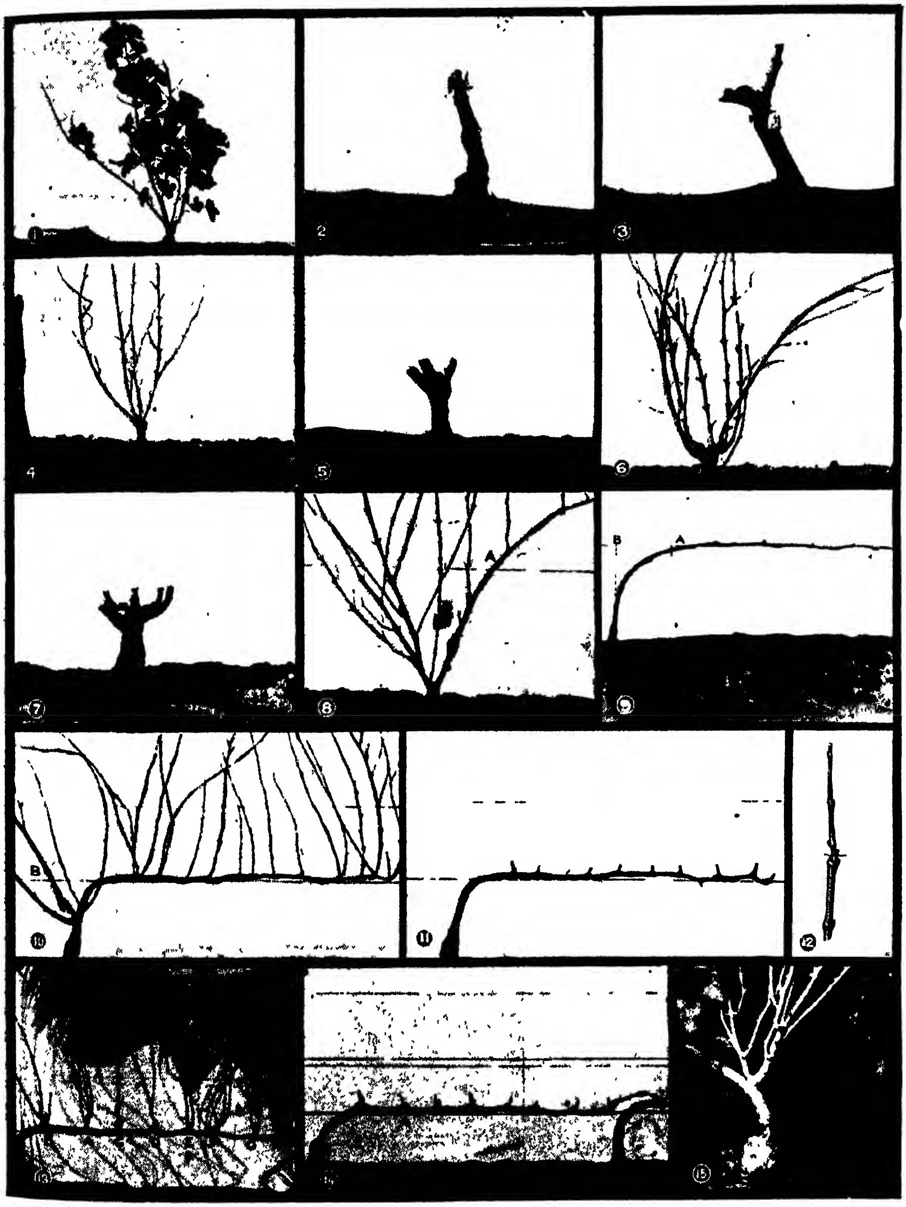


PLATE I

are cut away, leaving one spur with two eyes, as in Fig. 2. Two or even three spurs may be left if exceptionally strong growth has been made. Fig. 4 represents the second year's growth, and should be pruned to three or four spurs of two eyes each, as in Fig. 5. These will eventually form the main arms of the goblet, as in Fig. 7.

TRELLISED VINES.

Unilateral Cordon or permanent rod with spurs is also called the Royat.

The writer favours this system for the variety or varieties of uniform growth and grown as trellised vines.

The first season's growth from the cutting is pruned as in Fig 2, which should eventually produce a growth similar to Fig. 8. By judicious pinching and stopping of laterals and other shoots not required one long, strong cane will be produced by the end of summer. (Fig. 8 A.) At the subsequent winter pruning all the side shoots are cut clean off, leaving only the one rod. The vines being planted 7 ft. apart, this cane should be pruned back to a little short of that length and tied down to the bottom wire of the trellis with a graceful curve. (See Fig. 9.) The bottom wire should be about 18 in. from the ground. The following winter this cane becomes a permanent rod with canes (see Fig. 10); each of these canes is then pruned to two eyes, as in Fig. 11. All spring and summer shoots arising from the neck of the vines and underside of the rod must be rigorously suppressed. The curves in Figs. 10 and 11 are too sharp and have caused the strong growth at B, which should have been rubbed off on its first appearance.

The first spur on the rod should not be less than 12 inches from a vertical line of the base (Fig. 9). At the succeeding pruning it will be found that most of the spurs will have put forth two canes (Fig. 13 and Fig. 13B); the top cane should be cut out close to the lower one,

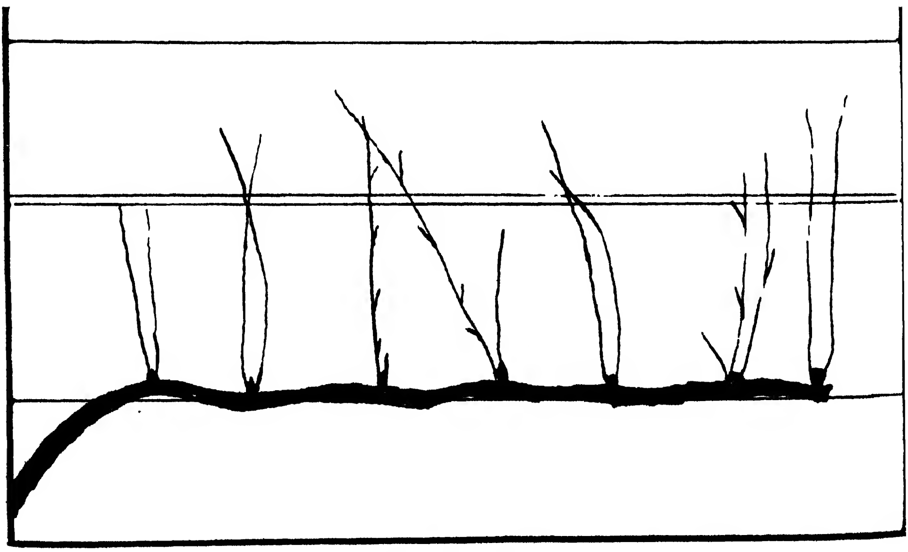


FIG. 13B.—Unilateral Cordon Vine before Pruning.

and the remaining cane pruned to two eyes (Fig. 14). Should only one cane have issued from a node, it must be pruned to two eyes. The last spur on the rod is treated differently. Of the two canes issuing there-

from, the upper one is pruned to several eyes and tied down to meet the first spur of the next vine (Fig. 14). This is called the annual terminal fruit branch, with return spur beneath (which is better illustrated in Fig. 14B) and acts as a safety valve to the superfluous sap flow, also as

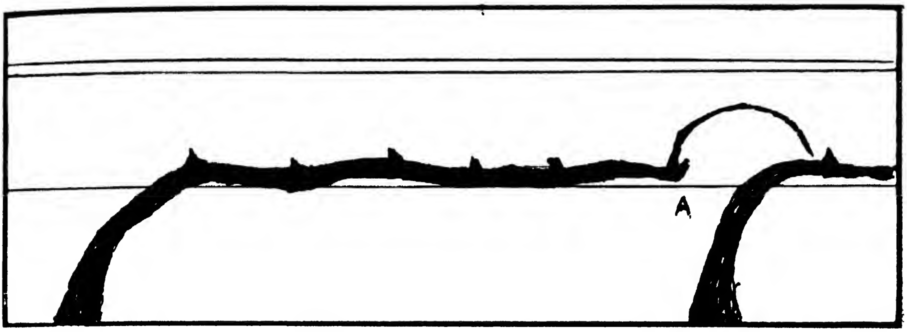


FIG. 14B.—Similar Vine after Pruning.
The annual terminal fruit branch is here more distinctly shown.

a protection to the neck of the adjoining vine. The lower cane is pruned to two eyes, forming the return spur, and will furnish two canes for the following season, to be treated in the same manner. The terminal fruit branch is only an annual expedient, which is pruned off at each winter pruning and is again reproduced from the upper cane of the return spur left for the purpose. (*The above figures refer to Plate I.*)

THOMERY SPALIER OR BI-LATERAL CORDON.

This is a two-armed vine, and is formed as follows:—

An upright shoot arising from a young vine in spring is pinched back before approaching the bottom wire. Several laterals will eventually

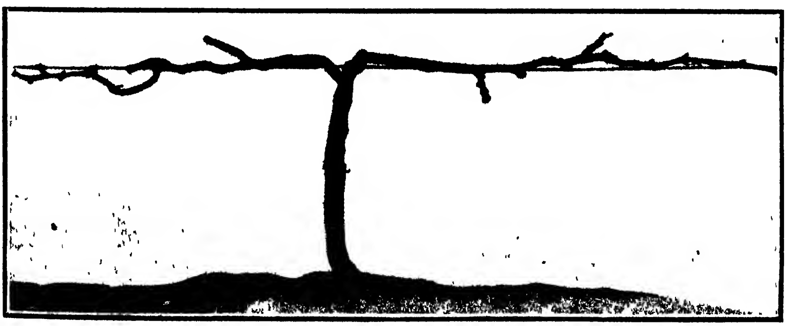


FIG. 11.—Thomery Spalier.

push forth; the top one is allowed to grow, whilst others beneath may be pinched back at their first leaf. The lower laterals are not required except for the purpose of elaborating sap to strengthen the main stem. The following winter the growth will be similar to Fig. 12, Plate I., when the lateral cane is pruned as indicated by the dotted line, *i.e.*, near its base and above the group of eyes showing at that point.

Several shoots may issue from this point during the following spring, and two of these should be selected and trained along the wire, one on each side, as main arms or permanent rods. Other shoots are rubbed out. At the next pruning the rods are shortened to meet those of the neighbouring vine. The canes issuing from the nodes of these two rods are pruned to two eyes as in the Royat system.

Two examples of Thomery spur pruned vines are shown in Figs. 11 and 12.

FIG. 12—Thomery Espalier (aged).

LONG PRUNING.

THE BORDELAISE SPALIER.

This is an excellent system for almost any class of vines.

Select a young vine which has been pruned to two spurs, as in Fig. 3, Plate I. The following spring several canes will issue from these two spurs. At the subsequent pruning the upper cane, or the one situated furthest from the base of each spur, is then bent down to the wire and shortened to six, eight, or more eyes, and the return spurs nearer the base are pruned to two eyes. The return spurs may produce fruit, but their chief function is to provide canes and spurs to replace the annual fruit canes already tied down, and which are completely cut out after producing their one crop. As will be observed, the object of this method is to provide new fruit rods and spurs for every year's crop. (See Figs. 13 and 14.)

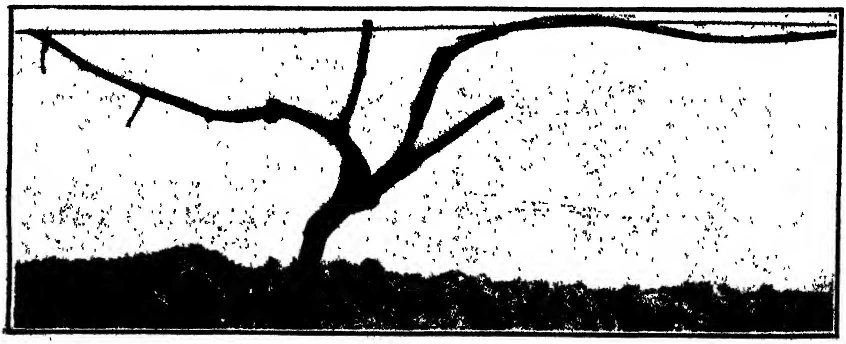


FIG. 13.—Bordelaise Spalier.

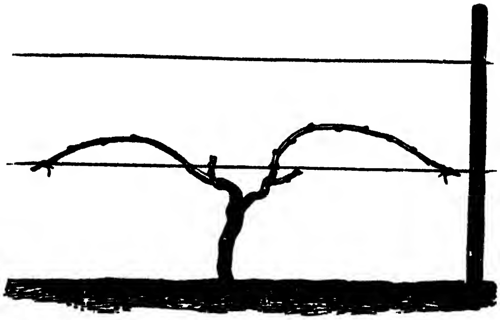


FIG. 14.—Bordelaise Espalier.

THE CASANAVE CORDON.

The vine is pruned as a uni-lateral cordon. After the permanent rod has been laid down, short pruning is followed until it arrives at the stage shown in Fig. 13, Plate I. The upper cane at each spur is now shortened and tied down, and the return spur pruned to two eyes (Figs. 15 and 16.) Where only one cane occurs, it should be pruned to two eyes.

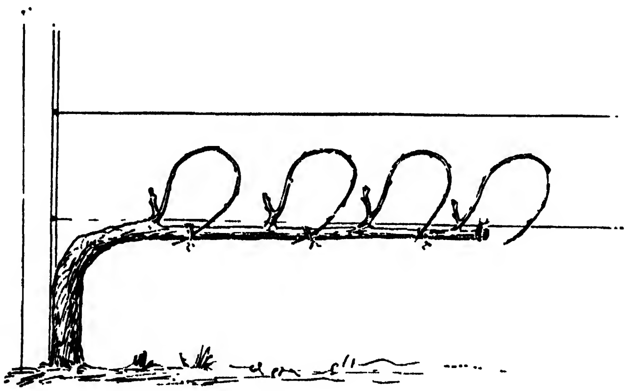


FIG. 15.—Casanave Cordon Fruiting Canes and Return Spurs.

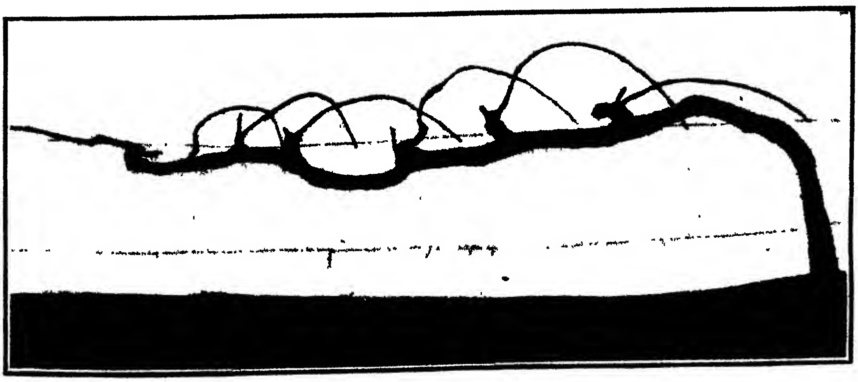


FIG. 16.—Casanave Cordon, Fruiting Canes and Return Spurs.

HIGH AND OVERHEAD TRELLIS.

It is often desired that cottage and villa gardeners require an overhead shaded walk or drive, pergola, or summer-house covered with diciduous plants, for which there is no better subject than the grape vine. It must be borne in mind that the most vigorous varieties should be selected, and if the sides and roof of such structures are to be properly adorned, separate vines are necessary for each purpose. Say, for instance, a covered avenue of any length is desired, cuttings or rooted plants may be put in at intervals of 6 ft. along each side of a walk of not less than 10 ft. wide. Each alternate vine is then trained to an upright stem, and on reaching the height of the structure is stopped, and two of the shoots issuing therefrom are trained right and left, and at the following pruning are stopped on approaching the arms of the next vine. At the subsequent pruning three or four canes may be allowed to proceed from each arm and tied down to cover the roof. Any growths issuing from the main stem itself must be suppressed, and it is unwise, no matter how fertile the soil may be or how strong the vine may grow, to allow it to cover the upper structure in less than three seasons. The same method of stopping and winter pruning must be adopted in the initiatory stages as that of other systems. The intermediate vines for furnishing the walls only are treated in the same manner as the Royat or Guyot.

The fan-shaped vine or any one system is not satisfactory for furnishing both roof and walls. (See Fig. 17.) Separate vines are used for each purpose. The lines indicate where the canes should be pruned.

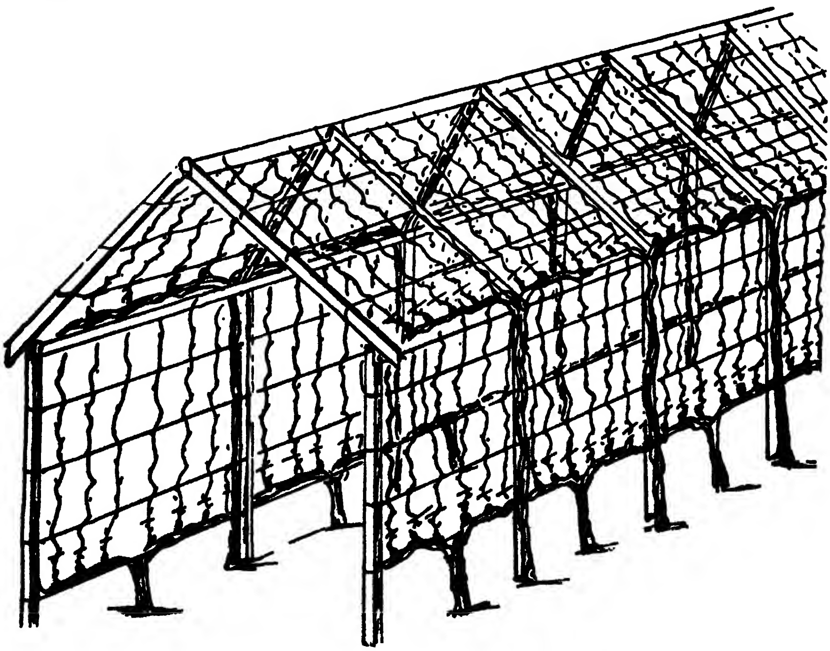


FIG. 17.—Showing Separate Vines for Covering Walls and Roof. Short lines indicate where the canes are to be pruned.

There is another system of pruning which, in some cases, it is absolutely necessary to follow. Some varieties of grapes, such as Ohanez (Almeria), Schradzouli, Calabrian Raisins, and several others would never satisfactorily bear at Westbrook with either short or long pruning by the foregoing systems. Lateral canes should be encouraged by stopping the summer growth. It has been proved on such varieties as the above that strong, well-ripened, lateral canes are the only medium

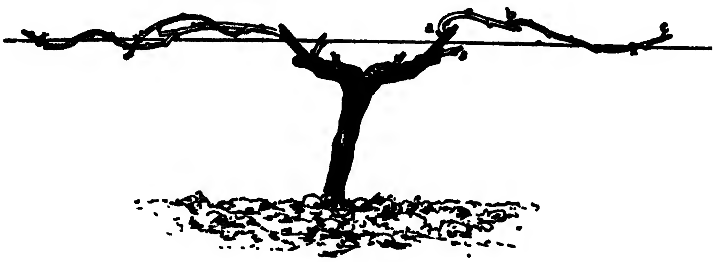


FIG. 18.—Long Pruned, with Return Spurs—mainly Laterals
a, b, main cane; b, c, lateral.

for producing a good crop. Fig. 18 shows how the canes were stopped and laterals produced the previous summer, and the subsequent winter pruning.

SUMMER PRUNING.

In the case of vines that have been properly spurred back at the winter pruning—*i.e.*, each spur pruned to one, two, or more eyes according to the vigour of the canes and the variety of grapes—each bud should have put forth one or more shoots. Where more than one shoot occurs, the weakest should be rubbed off, leaving one shoot only at each node. If the vine is not a vigorous grower, one shoot may be sufficient to leave on each spur; on the other hand, where growth is rampant, two or more shoots may be allowed to proceed from the spurs. Overcrowding is to be avoided by entirely suppressing some of the intermediary shoots where the long spur or cazanave is adopted.

It often happens that amateurs and inexperienced growers leave many more bunches on the vine that it can properly support, especially in the case of young vines of three years old, and the consequence is that the bearing period, and even the life of the vine, is shortened, or its production diminished in after years; therefore, the disbudding of fertile shoots may be equally important with that of the barren ones. The uppermost shoot, or shoots, of a spur generally absorb an undue amount of sap to the detriment of the base shoot. Such growth must be carefully watched, and, if extraordinary vigour is produced, it may be checked either by bending down the shoot or pinching out the terminal points. The side branches from these shoots, called laterals, produced from below the node where the bunch is situated, should be rubbed out; but laterals from the nodes at and above the bunch may be pinched at the first or second leaf. The lower shoot of a spur—*i.e.*, the one nearest home—should be encouraged to grow strong, as this will consti-

tute the fruiting spur for the following year. Indiscriminate topping must be avoided. The leading shoots of the vine should be allowed to extend their growth almost to an unlimited extent, but in cases where they are outbalancing the vegetative activity of the vine, they should be stopped. It is even better to bend down the shoots than to top them too severely. The object of this method is to preserve as much well-grown foliage as possible for the accumulation of sugar and elaboration of sap for the benefit of the fruit and lignification of wood. The bunches are always better developed, more handsome in appearance, and of higher quality when ripened in the shade; but when the shade becomes too dense it is better to strip off a few of the older leaves at the base that have fulfilled their purpose than to cut away the branches.

CINCTURING OR RINGBARKING AND GIRDLING.

This method is largely practised in the Southern States and other vine-growing countries. A more uniform setting of the fruit, larger berry, and earlier maturity is assured. The cincture is performed by

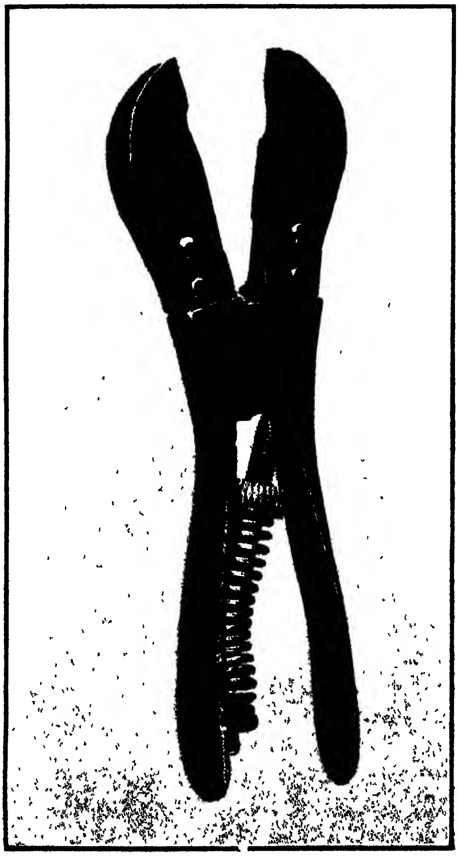


FIG. 19.—Cincturing Instrument.

removing a very narrow ring of outer bark without injuring the woody tissue or cambrum layer. The effect is to check the return flow of sap, which is then elaborated in the bunches and foliage instead of proceeding to the root. The best time to do this is when the vine is in full flower; if done later it is useless for increasing the setting, but will ensure a crop of seven to ten days earlier than untreated vines, which is important for catching the early market. Either young or old rods may be treated. Where old rods have been denuded of spurs, new shoots may be encouraged to start if the cincture is made below the old node. A knife may be used for removing the ring, but it can be done much quicker with the small instrument in Fig. 19.

Fig. 20.—Cinctured Vine.

Girdling is simply a piece of No. 8 or 10 wire twitched round the large limbs of fruit trees. The navel orange, mango, and other fruits have given good results from this treatment, although the girdle is never so satisfactory as the cincture.

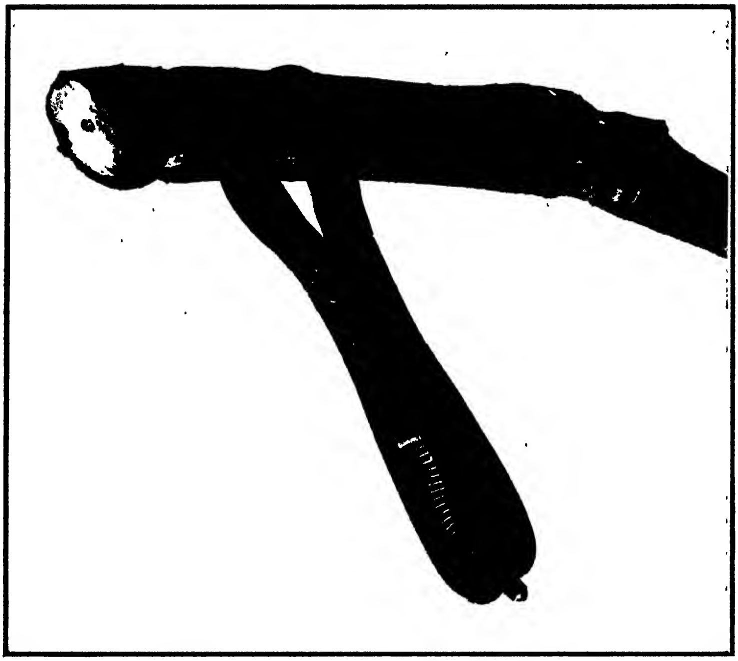


FIG. 21.—How Performed.

FIG. 22.—Grapes after Vines being Cinctured.

FIG. 23.—Uncinctured Vine.

DISEASES AND PESTS.

Phylloxera vastatrix or Vine Louse.—It is hardly worth while to combat this disease when firmly established. It is preferable to root out infested vines and plant none but those grafted to immune stocks.

Anthracnose, Black Spot, Oidium, and Fungus generally are best prevented by the sulphuric acid solution, which is swabbed on every portion of the vine in spring, just before the buds are bursting, but must not be applied after growth has started or every bud would be destroyed. As soon as the young foliage appears, the whole vineyard should be freely dusted with flowers of sulphur or sprayed with weak Bordeaux mixture, and repeated at three or four week intervals up to the time the berries begin to colour.

Formula for sulphuric acid is ¾ pint to 1 gallon of water. Care must be taken when mixing this solution, and the acid must be added slowly to the water to avoid splashing. Old clothes should be worn when applying.

There is an excellent preparation now being sold in Brisbane called "Atomic Sulphur." It is largely used in California and in our Southern States. Being in liquid form, it is applied as a spray against all fungoid diseases.

Caterpillars of the vine moth and other leaf-eating insects may be destroyed by arsenate of lead spray. If white ants attack the vines, a few pounds of Kanite dug about the stems will get rid of them.

MANURING.

Vines planted in well-prepared virgin land will not require manuring for the first two or three years, but after that period, or when they arrive at the full bearing stage, the fertility of the soil should be kept up.

I cannot do better than give the remarks of our Agricultural Chemist, J. C. Brünnich, on this subject:—

"Improved methods of cultivation and the use of artificial fertilisers increase yield and quality of the fruit considerably. Excellent results have been obtained in South Australia with a yearly application of—

1 cwt. superphosphate
¼ cwt. sulphate of potash
¼ cwt. sulphate of ammonia
} per acre.

or applying about 3 oz. of the mixture to each vine.

"In many localities a heavier dressing of artificial fertilisers may be profitable, using for instance—

2 cwt. superphosphate
1 cwt. sulphate of potash
½ cwt. sulphate of ammonia or nitrolim
} per acre.

or about ½ lb. of the mixture to each vine.

"Green manuring, in addition to the yearly application of artificial fertilisers, is strongly recommended, and the crop should be ploughed under to a depth of at least 9 in."

Liming the soil every five or six years with about 1 ton of air-slaked lime or gypsum per acre may also be very profitable.

A FLY DESTROYER.

H. Maxwell-Lefroy (curator of the insect house at the London Zoo) at Fly Farm, Middlesex, would appear to have solved the problem of a cheap and effective trap. This experimenter has tried every imaginable bait, from strange chemicals to beer and bananas, and he has at last found the ideal bait that fills his bottle traps full of flies. It is casein, brown sugar, and water mixed in equal parts. This mixture must be left to stand for twenty-four hours or so before a fly will take much notice of it. Then some slight change sets in, due no doubt to fermentation, and from that moment it will not be kept away. Some subtle smell about the mixture appeals to house-fly taste, and they surge anxiously round the bottle, looking for the way in. Casein, as you know, is the chief solid in milk, the curd from which cheese is made. It can be obtained by scouring the milk, or by the use of rennet, as employed by cheesemakers. It may be worth mentioning that the slime left in the bowl of the separator consists largely of casein, and as this is entirely a waste product it might well be tried first in combination with the sugar and water as a bait for the flies.

Tropical Industries.

RICE.

Some years ago (about 1901), rice was grown in both South and North Queensland and was found to be a very profitable crop. In the South the district lying between the Logan, Albert, and Pimpama Rivers, known as Pimpama Island, proved itself eminently adapted to the successful cultivation of this crop. The soil consists of sandy loam, containing in a remarkable degree the constituents most suited to the nature and requirements of the plant, being easy to work, but somewhat tenacious in wet weather. Layers of decomposed marine shells are found in considerable quantities, indicating that these lands were once ocean-washed, and the receding waters left valuable deposits of lime and other constituents in the soil, which, together with the rich humus formed by the decaying foliage of scrub vines, palms, ferns, &c., of rank tropical growth, have left these patches of soil of varying area between the swamps most suitable for rice culture.

There is no great labour required in the preparation of the land for this crop. With Upland rice, the question of drainage does not enter largely into consideration; at the same time, stagnant water is detrimental.

To bring the soil to as fine a tilth as possible, the ordinary methods may be adopted—that is, to first plough, letting the soil afterwards lie for a week or so to ærate and sweeten. Then cross-plough and harrow. The best time for sowing is in September or early in October, when the first rains may be expected in normal seasons. There are three systems of sowing. Broadcast (chiefly for fodder purposes), planting in drills, and transplanting from nursery beds. For broadcasting, 60 lb. of paddy (unhusked seed) to the acre will be needed, the seed being harrowed and treated in the same manner as oats or wheat in the after cultivation. The plan most generally adopted, and by far the best and cheapest, is to plant the rice in drills 2 ft. 6 in. or 3 ft. apart, and about 10 to 12 in. between the plants, by means of a seed drill. This will require 35 to 40 lb. of seed per acre. By the drill plan, the crop will be more even, and not so patchy as when sown broadcast, and it enables the grower to go through the crop with the hoe on the cultivator. The third plan, we may dismiss an impracticable, as it is a most tedious and costly method, only adopted in countries where coloured labour is plentiful and very cheap, and where swamp rice is the variety universally grown in such countries. Briefly, the seed is sown in nursery beds 20 ft. long by 6 ft. wide, which will give sufficient plants for a quarter of an acre. When the plants are 6 in. high they are planted out in the soft, swampy soil about 1 ft. apart in rows 2 ft. 6 in. apart. The labour involved is a very serious

consideration, and the cost may be imagined by considering what the cost of planting out wheat, barley, or oats in this fashion would be. Furthermore, swamp rice requires a system of irrigation by which the fields may be inundated at certain stages of growth, and this is not feasible in many districts where Uplands rice would be grown to a profit, given a normal rainfall.

From the "Tropical Agriculturist," Ceylon (15th October, 1915), we learn that in British Guiana the cultivation of rice rose from 6,000 acres in 1898 to 45,000 acres in 1914, an increase which represents about 32,000 tons of cleared rice per annum, worth about £450,000. The rice there grown is known as "Creole," the choicest strain of which is "Berbie." It was found that locally-grown paddy gives from 60 to 65 per cent. of its weight of clear rice. In 1914, 240 tons of rice meal were exported. The average yield of paddy per acre in Guiana is 22·2 cwt. and equivalent to 41 bushels.

HARVESTING THE CROP.

This was a difficult matter to undertake with the rice formerly planted in the Logan district, the China and some of the Japan varieties being so brittle that when ripe the least touch caused the grains to drop off with a consequent loss of seed. This has been happily overcome to a certain extent by the better variety planted. Not only does the White Java give better facility for harvesting, but the straw is of a better colour and quality, of a good length, averaging from 4 ft. to 5 ft., and in good land even 6 ft. is no unusual length; and no more fair or gratifying sight to the farmer's eyes can be imagined than the rich appearance of a rice field ready for harvesting: this is whilst the stalks have still a bronze-green appearance, the heads have turned a golden brown, about half-way down, and appear what a wheat farmer or an inexperienced person would deem three-parts ripe. The heads of rice, heavy with grain, have a graceful, drooping appearance; as many as thirty to forty heads have been produced from a single grain planted—the product weighing from 10 oz. to 14 oz. By cutting some varieties of rice in this state, the loss is not so great as with over-ripe grain. The cutting is begun in the morning as soon as the dew is off, the rice being bound up into very small bundles, ready to be threshed as soon as possible (which will be explained later on). Rice is never left stooked in the field, but is treated as quickly as possible.

The usual method pursued in harvesting is to cut with the ordinary sickle or reaping-hook, although where large areas are now being planted it is thought that the latest inventions of wheat-harvesting machinery could be used most effectively. A slight alteration in the reaper and binder might be required in the way of lighter and broader wheels on

the rich soft rice lands, but otherwise I see no difficulty in the harvesting. At all events, it is the intention of the writer to induce some firm to make a trial at next harvesting as an experiment, and if successful a machine will doubtless be obtained on co-operative lines for the use of the district. After cutting with the sickle, the rice is gathered into bundles and carted into the barn or shed, or, if not sufficiently dry, is left for a day or so to ripen; but this it not often the case, experience having taught our farmers the right time to cut, and it is generally taken to the barn at once for stripping or threshing.

RICE-GROWING IN VICTORIA.

The "Australasian," writing on the rice industry in Victoria, said:—

"From time to time reports have appeared of experimental work in rice-growing, carried out by Mr. I. Takasuka, of Tyntynder West, on the Murray River. Mr. Takasuka has been working on the principle that rice growing in a temperate climate is always of a better quality than that grown in the tropics, and has experimented with fifty-six varieties to discover one suitable to the soil and climate of his district. He has found, according to a report furnished through Messrs. Law, Somner and Co., a variety called Kahei to be the best, and has improved this variety by selection for four years until the selected seed, which is named after himself, is deemed suitable to our Victorian soil and climate.

"At Tyntynder the seed is sown from September to November by drill or broadcast at the rate of 40 lb. to 60 lb. per acre, according to the soil. The seed germinates at a temperature of 56 degrees, and the plant does not suffer from frosts. At the end of December the plant stools out, sometimes to thirty shoots from one seed. From three to eight waterings are necessary, according to soil and season; but in any district where there is a good rainfall between November and February a good crop can be reckoned upon. Rice ripens from April to May, and can be stripped or winnowed, or cut with a binder and threshed, after drying in the stook. Mr. Takasuka recommends the latter method for large areas, and considers that there are thousands of acres in Victoria not suitable for wheat-growing which can be profitably turned into rice country.

"Most people think rice cannot be grown in cold places, but if it is acclimatised it will grow just the same as in warmer parts. Imported rice mostly comes from Burmah, where they cannot grow as good quality as here. An average yield over a fair area is half a ton per acre, but the selected variety has given over 1 ton per acre, which is worth from £14 to £18 per ton.

"We import £200,000 worth of rice every year, and it pays a duty of 3s. 4d. per cwt., so that where irrigation can be practised it may pay to grow instead of wheat. Rice straw is used for making ropes, matting, and bags, and is considered in the East a valuable feed for stock, which, harvested in May, comes in when other feed is scarce. After the grain is stripped, the straw that is left can be cut close to the ground, and this is excellent for chaff. The stubble will then make a splendid grazing for all stock. On 40 acres seventy horses were kept for five weeks, and then followed by 500 sheep for two weeks last season."

We now learn that in accordance with an arrangement made eight years ago, when permissive occupancy of 200 acres of land at Tyntynder, near Swan Hill, Victoria, was given to enable experiments to be made in rice-growing, the Lands Department has now granted a perpetual lease of the area named to Mr. I. Takasuka, a Japanese, who has conducted the tests.

Mr. Takasuka showed Mr. H. S. W. Lawson, Minister for Lands, recently, some fine samples of rice both in ear and winnowed. He said that he had been handicapped last season, as there was insufficient water. From 10 acres he had secured an average of half a ton to the acre, or 5 tons in all. In good spots he had obtained as much as 1 ton to the acre. Samples had been sent by him to agricultural schools in Victoria and New South Wales. He had been assisted by his three children—two boys and a girl.

About seven years ago Mr. Takasuka brought out from Japan an expert to assist him for ten months in making the initial experiments. He considers that the land in the Swan Hill district is suitable for rice-growing.

Messrs. Law, Somner and Co., seed merchants, Swanston street, Melbourne, have been appointed sole agents for the sale of Takasuka rice seed. The price for small quantities is 2s. per lb. For lots of 1 cwt. 1s. 9d. per lb., and for 2 cwt. lots or over 1s. 6d. per lb., carriage extra.

It seems strange that whilst we have thousands of acres of land admirably suited for rice-growing, we have allowed the industry to drop, and import rice to the value of £96,000 a year, all of which could be as easily grown as wheat or maize, and to a greater profit, employing, as in other rural industries, only white labour.

In 1899, the total area under rice in Queensland was 319 acres, which produced 9,275 bushels of "Paddy," equal to 320,617 lb. of clean rice. In that year, over 9,000,000 lb. of rice were imported into Australia. In 1915, the area under rice in Queensland had dwindled to 3 acres, producing 66 bushels of grain (paddy), which was the least average yield since 1911. The highest average yield was in 1908, 38·57 bushels per acre. In the Pimpama district, the yield frequently amounted to 40 bushels of paddy per acre.

Entomology.

COMBATING THE CANE BEETLE.

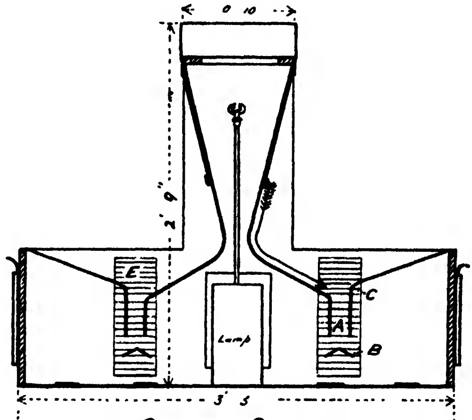
The General Superintendent of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist to the Bureau, for the month of January:—

Field investigations in connection with the oviposition of our cane-beetles (*Lepidiota albohirta*) proved disappointing, a single batch of eggs having been discovered as a result of an examination of about 150 cubic ft. of ground. These eggs, to the number of thirteen, were found deposited loosely in the soil at a depth of 5 in., and almost directly under the centre of a stool of ratoon cane. It was hoped to have secured sufficient evidence to warrant the publication of recommendations regarding control of this stage by the practise of certain cultural methods during the period immediately preceding oviposition. Such advice, however, will need to be postponed until next season, when it is expected to obtain conclusive data on this important matter. Breeding experiments undertaken at the laboratory for the purpose of determining the quantity of eggs layed at a time, and whether a beetle deposits more than one batch, yielded evidence of a somewhat indefinite nature, the numbers laid by different specimens varying from ten to twenty-six.

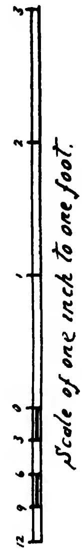
As a result of numerous dissections, I am inclined to believe, from the structure of the ovary, that the majority of eggs usually mature simultaneously and are deposited in one large batch of about twenty-four, after which, under normal conditions, a few additional eggs may be laid loosely in the soil either singly or in small batches containing three or more. The two ovaries together comprise twelve ovarian tubes, the stalk of each holding three eggs, two of which, in each tube, develop first as already mentioned, while the other twelve furthest from the oviducts continue quite small. After deposition of the main batch of twenty-four these others may develop, although apparently the full number rarely do so. Examination of the ovary of a beetle that died in confinement after laying twenty-six eggs revealed the presence of an additional nine in different stages of growth. Under natural conditions some or perhaps all of these might have found their way into the soil before the death of the female. About 350 young larvæ were hatched from eggs laid by mealy-back beetles confined at the laboratory during December and January, and will be used in future experiments relating to the control of the grub stage of this pest.

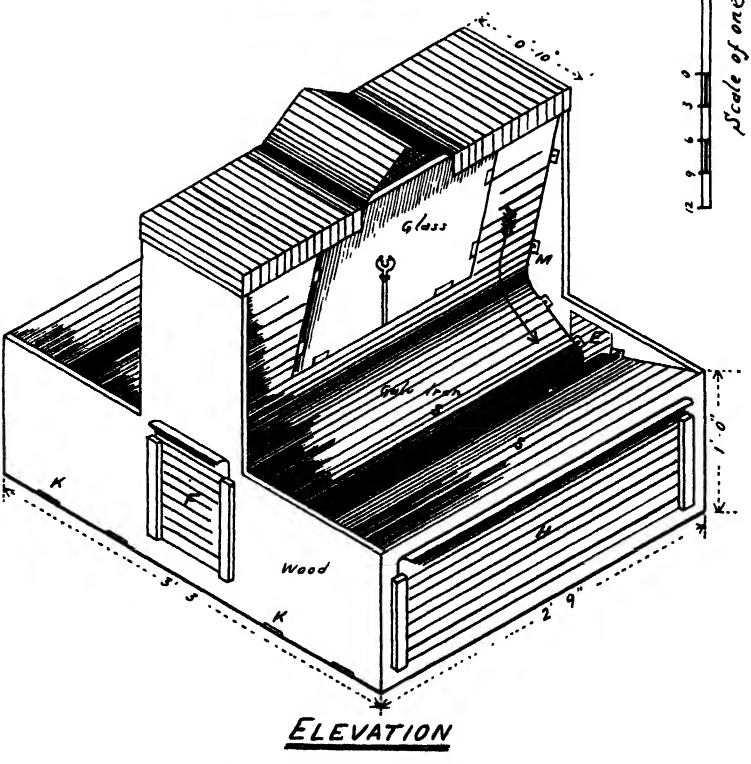
A NEW LIGHT-TRAP FOR CANE BEETLES.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following description and illustrations of an original form of light-trap from Mr. Edmund Jarvis, acting Entomo-



CROSS SECTION





ELEVATION

logist to the Bureau. Mr. Jarvis states that the trap is suitable for capturing our "mealy-back" cane beetle (*Lepidiota albohirta*), and designed with the purpose of taking advantage, firstly, of its mode of

approach and behaviour whilst reacting to white light; and, secondly, of its inability under certain restrictive conditions to fly from off the ground in a vertical direction.

Mode of Reaction.

In a previous report ("Australian Sugar Journal," vol. VII., pp. 448, 449), it was mentioned that this insect, instead of attempting to dash directly into the flame, approached it in an erratic manner by a series of short flights, settling at brief intervals on the ground or on cane-plants, and ultimately plunging headlong downwards at a distance of about 1 foot from the light.

Referring to the accompanying illustrations, it will be seen that the galvanised-iron landing stage (S), inclined at an angle of about 30 degrees, affords no foothold to beetles falling upon it, which are at once shot through the aperture (A) on to a narrow strip of metal (B in section), from which they slip into the body of the trap. Those striking the ground near by invariably endeavour to reach the light by making short upward flights, until finally pitching upon the stage and unable to cling to it they slide downwards to captivity by mere force of gravity, owing to a habit possessed by this species of keeping its wings closed for several seconds after settling.

Both sexes react strongly towards acetylene light throughout their aerial existence, and in the event of first attempts to reach the flame during windy nights proving unsuccessful generally work to leeward of the trap and fly in against the breeze.

Reaction ceases a few minutes after capture, the specimens remaining stationary for the rest of the night and apparently unaffected by the entrance or motions of additional victims. Cane beetles passing overhead usually circle around the light for a second or two before attempting to settle on the stage, but occasionally make a sudden dash for the flame and encountering the glass are shot by the impetus in the direction of the arrow until they strike the horizontal ridge marked (C) and drop into the trap. Escape is impossible, as the species in question cannot take flight from the narrow strip (B) owing to want of room in which to expand its wings, and, moreover, is unable at any time to fly up vertically, a fact that may be simply demonstrated by putting a healthy mealy-back cockchafer into an empty ½-lb. cocoa tin and leaving it on a table with the lid off, when it will be found that, although the insect may live several days, its numerous attempts to escape from the open mouth prove unavailing and it will finally die there. Similarly, the strips of kerosene tin on sides of the trap at (E) by affording no foothold effectually prevent egress in that direction.

Results.

Unfortunately, owing to pressure of work and the occurrence of moonlight nights during the period of greatest emergence at Meringa, the trial of this light-trap was postponed until after oviposition had taken place and the majority of beetles forsaken the canefields.

Immense numbers had also perished on the 20th December prior to oviposition as the result of a heat wave.

On 24th December it was decided to light the trap for the first time, as the moon did not rise until 9·15 p.m., and would thus allow an hour and a-quarter of darkness. It was accordingly placed among young plant cane and provided with an acetylene lamp of 21 litres capacity. This was lighted at 7·45 p.m., as a few cockchafers were heard buzzing about, but no positive reaction took place until 8 o'clock, when it had become quite dark. The sky at this time was somewhat overcast, the thermometer registering 81 degrees F. and a light south-easterly breeze blowing.

Beetles now commenced to fly into the trap from all directions, many being attracted while in the act of passing rapidly overhead about 15 feet above the ground.

By the time the moon had risen, at 9·15 p.m., 57 specimens of *albohirta* had been captured, and during the next twenty minutes 9 more entered in spite of the moonlight, making a total of 66. The experiment was then discontinued, as beetles had stopped flying, but I have no hestitation in saying that had they been present in force a greater number would have been caught. Such, too, would have been the case if the light had been placed near food-plants; but the above experiment was purposely conducted about a mile and a-half from a favourite feeding ground, so that the only specimens captured were those actually invading the plantation. No doubt it will be argued that the popular method of gathering cane-beetles by shaking them from bushes, &c., is both simpler and more likely to be remunerative than any attempts at trapping by means of artificial light. To this I would reply, that present methods of collecting should, of course, be continued, since they deal with vast numbers frequenting feeding-trees, many of which—during a period of about two weeks immediately following a general emergence—are females carrying eggs in various stages of development; but at the same time we are apt to forget that the ordinary collector altogether misses great numbers of pregnant females that having succeeded in eluding capture in the trees finally visit the canefield at night for the purpose of entering the ground to oviposit. It is these beetles, in fact, that are directly responsible for future trouble; and, further, I am disposed to believe that practically all the annual damage done to a crop is effected in each district during one or more favourable periods of about four consecutive nights each. This assumption is not unreasonable when we reflect that a general emergence of cockchafers occupies about three days and is at once followed by copulation, and that a fortnight later or thereabouts most of the females of this brood are in a condition to oviposit. As soon as this critical stage is reached the plantation is sure to be invaded without further delay, and during the succeeding four or five nights, when such wholesale mischief is being worked, it assuredly behoves us to capture as many beetles as possible. In the event of natural conditions happening to be congenial, a number of light-traps placed at intervals among a crop of young plant or ratoon cane would probably catch the ority of egg-laden females entering the fields during this important

period, and on grossly infested areas could hardly fail to prove highly advantageous. Hand collecting certainly tends to thin the ranks of the enemy, but it is, I repeat, invading beetles, and those only, that do the mischief, therefore their capture must of necessity take place among the cane, and before they have had time to enter the soil. As already pointed out in previous reports, the only profitable time for using light-traps is during the interval between the acts of emergence and egg laying, the length of which is determined by climatic influences, and, in the event of an occurrence of two well marked emergences, may extend for a month or six weeks.

The number of favourable nights in this period, however, will depend on the position of the moon, temperature, and other factors. A dark warm night following a hot day offers ideal conditions, especially when rain has fallen during the forenoon, or the sky happens to be cloudy, and there is little or no wind. Should emergence take place at such a time excellent results would follow the use of light-traps during the next few nights; but in the event of these ideal conditions obtaining at the critical times of egg-laying alluded to above we should make the utmost use of so important an opportunity.

Construction of Trap.

The design of this trap is altogether different from that of the various forms advocated by other writers in the past, which appear to have been constructed without consideration of the aerial movements of our cane-beetle during its reaction to artificial light, and consequently failed to come up to expectations. The present trap not only takes advantage of such reactionary motions, but whilst capturing this pest permits the escape of parasitic and predaceous insects, many of which also fly to light, and from their presence in canefields doubtless serve a useful purpose by helping to maintain the balance of nature. Some of these species, as previously reported ("Australian Sugar Journal," vol. VII., pp. 448, 449), have already been recorded as natural enemies of certain insect pests of sugar-cane, and merit careful protection.

To meet this requirement it has been thought advisable to forego the use of solutions and allow captured beetles to remain alive. They become inactive and torpid after daybreak and can then be transferred without difficulty to bags in the usual way, and sold to help defray expenses.

The construction of the trap used in this experiment is shown by the accompanying illustrations, and consists of a light framework of wood with flat bottom of deal or galvanised-iron, enclosing an inclined platform, sliding doors, roofing, &c., of the same metal bent to the various curves shown by the cross-section. Two small panes of stout glass are inserted in opposite sides of the vertical upper portion of the larger sheets, and a piece of close mesh wire-gauze in the centre of the roof just over the flame. The lamp is introduced through a small door at (F) the two larger sliding doors in opposite sides—one of which is shown at (H)—being used when removing the beetles. The iron trays

covering ends of roof are moveable, and the end of one is bent up to form an angular hood over lamp to exclude rain. Parasites and predaceous beetles escape through the slit-like openings indicated at (K), which being only a quarter of an inch high prevent the exit of small cane-beetles—*Anomala australasiae,* for example—a few species of which are attracted by artificial light.

During the experiment in question the trap was stood upon four butter boxes (one at each corner), the acetylene flame being not more than 3 feet above ground level, but higher than the cane. The glazed sides were faced south-east and north-west—the principal line of flight taken by this insect—while the area of direct illumination extended northerly from west-south-west to north-north-east, and southerly from east-north-east to south-south-west. A handy man could make this trap in a few hours. The author found it a simple matter to construct the one used at Gordonvale. The materials needed are an old deal packing case, about 34 square feet of galvanised-iron, 2 panes of glass 18 in. by 12 in.. and half a square foot of wire-gauze; costing in all, owing to present high prices, about 15s. A simply way of fixing the iron by means of small oblong pieces left for the purpose when cutting the sheets is shown at (M).

Recommendation.

On the whole, the above-mentioned results appear satisfactory enough to warrant further experimentation with this form of light-trap or such modification of it as may be found desirable on the score of greater simplicity or cheapness; and I would suggest the advisibility of constructing a number for trial next season. These should be placed in the centre of a badly infested plantation at regular distances apart with the object of protecting a definite area of young plant cane.

MANGO VINEGAR.

We are indebted to Mr. Charles Meilland, Byfield, Yeppoon, for the following recipe for making mango vinegar, for which we were asked by a correspondent in November last. At that time we were unable to give instructions as to how to make it.

Mr. Meilland has been making mango vinegar for several years with great success, and his recipe is:—

"When mangoes ripen, peel them, and place them in a small barrel. Cover with water and leave them in it for a week. Then strain the juice and add 1½ lb. of sugar to every gallon. After this, bottle, and in four months the vinegar is ready for use. The older it is, the better. It makes a splendid table vinegar. The pure mango juice without water added, makes a stronger vinegar.

"Mango wine can be made much in the same way, but more sugar is required."

General Notes.

UTILISATION OF CORN COBS.

Much has been written in the United States, both in agricultural newspapers and in official bulletins issued by various agricultural universities of several States, on the value of corn cobs as an adjunct to fodder for stock. As far as Queensland is concerned, corn cobs have no value in the opinion of maizegrowers. They are often used as fuel, but otherwise they are allowed to rot in heaps on the farm.

Now it has over and over again been demonstrated by long-continued experiments in the United States that corn cobs have a considerable food value when ground up along with the corn into a meal. The " Journal of the Jamaica Agricultural Society" (November, 1915) in an article on the subject states that, as the result of an experiment made in the United States, where 10 pigs and 20 steers formed the subjects of the experiment, the object being to test the question of the food value of corn cobs, it was found that 1 lb. of corn and cob meal was worth more, as a food, than 1 lb. of meal made from the corn alone. Now, as there is a large proportion of the ear, *i.e.,* cob, the cob is worth about 18 per cent., it seems that there is an undoubted waste in not utilising the cobs—waste in two directions, because, first the corn has to be shelled and then ground into meal, whereas the shelling is saved by grinding the corn and the cob together; and secondly, the additional food value in the cob.

It should be borne in mind, however, that the corn and cobs must be ground fine, but the mills are set to do this. It has also to be remembered that to grind whole ears, about three times as much power is wanted than is needed in grinding the same amount of shelled corn. The following analysis should be of interest:—

—	Albumenoids.	Digest. Nutrients. Carbo Hydrates.	Fat.	Comparative Value.
	Per cent.	Per cent.	Per cent.	
Corn-cobs { from	0·6	41·7	0·2	37
Corn-cobs { to	1·1	43 2	0·4	49
Corn-stalks	1·1	37·0	0·3	36
Corn	8·4	60·6	4·8	100

* The above analysis was made by J. C. Brünnich, Agricultural Chemist to the Queensland Department of Agriculture, and appeared in the " Queensland Agricultural Journal " for January, 1916.—ED. " Q.A.J."

Professor E. W. Stewart, in his "Feeding Animals," recommends strongly to pass the whole corn crop—stalks, ears, and all—through a large cutter and reduce it to a fine chaff.

That corn cobs, which here are always waste product, have a very considerable value as stock food has been demonstrated in the long-continued general experience of American farmers.

A ton of ordinary wood when burned only gives 100 lb. of potash, 32 lb. of phosphoric acid, and 640 lb. of lime.

Sawdust when burned into ash gives 70 lb. of potash, 160 lb. of phosphoric acid, and 680 lb. of lime.

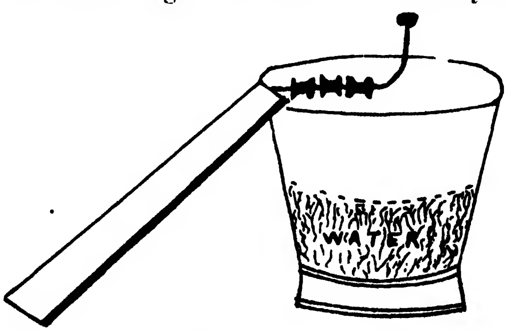
But a ton of corn cobs burned into ash gives 500 lb. or potash, 90 lb. of phosphoric acid, and 140 lb. of lime.

ORIGIN OF THE NAVEL ORANGE.

The navel orange first appeared at Bahia, Brazil, as a bud sport of the Portuguese variety of orange, *Laranja selecta,* and was first propagated by a Portuguese gardener at Bahia in 1822. These statements and those that follow are made on the authority of A. D. Shamel, physiologist of the United States Department of Agriculture, Riverside, California, who tells in the "Journal of Heredity," the results of an expedition to Brazil made by himself, P. H. Dorsett, and Wilson Popenoe. There are about 50,000 trees growing navel oranges at Bahia. The navel orange was introduced into the United States in 1873 by William Saunders, horticulturist and landscape gardener of the Patent Office. He got the American Consul to send him some of the trees, which he budded on seedlings grown in the Government greenhouses. He sent two to California and the others to Florida. The latter never amounted to much, but the former thrived and are still living and bearing fruit. All the navel orange trees in California are their progeny. There are about 100,000 acres of this variety in that State, and about 10,000,000 boxes are produced every year. The navel orange cannot be grown from seed, as it contains no seed. It is in California generally budded upon stocks from the Mission sweet seedling orange.—Exchange.

A NOVEL MOUSE OR RAT TRAP.

Mr. J. F. Keane, Carbeen, sends us the following sketch and description of an ingenious trap for rats and mice he remembers using during the great plague of mice on York's Peninsula, South Australia:—A small board, one end resting on the rim of an ordinary milk pail nearly



half full of water. A piece of No. 8 wire stuck into the end of the board, three cotton reels strung on the wire, and its end turned up with the bait. We always got the best bags with a piece of cooked bacon or a piece of toasted cheese. The mice were in such countless swarms everywhere that on one occasion I took the trouble to count the dead out of one pail—150 was the tally for that morning.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1916.

Article.		MARCH Prices.
Bacon	lb.	1s. 3d. to 1s. 5d.
Bran	ton	£5 5s.
Broom Millet	"	£32 to £35
Butter	cwt.	125s. 4d., 130s. 4d., 135s. 4d.
Chaff, Mixed	ton	£3 5s. to £6 5s.
Chaff, Oaten	"	£6 to £7
Chaff, Lucerne	"	£8 to £9
Chaff, Wheaten	"	£5 5s.
Cheese	lb.	10d. to 10¼d.
Flour	ton	£11 8s.
Hams	lb.	1s. 5d.
Hay, Oaten (Victorian)	ton	£8
Hay, Lucerne	"	£7
Honey	lb.	4½d. to 5d.
Maize	bush.	6s.
Oats	bush.	3s. 6d.
Onions	ton	£8
Peanuts	lb.	3d. to 4d.
Pollard	ton	£5 5s.
Potatoes	"	£14
Potatoes (Sweet)	cwt.	12s.
Pumpkins	ton	£7 to £8
Eggs	doz	1s. 6d. to 2s. 7½d.
Fowls	pair	4s. 6d. to 6s. 6d.
Ducks, English	"	4s. 6d to 5s.
Ducks, Muscovy	"	6s. to 7s. 6d.
Geese	"	8s. to 9s.
Turkeys (Hens)	"	11s. to 12s.
Turkeys (Gobblers)	"	17s. to 25s.
Wheat	bush.	6s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	3s. to 8s.
Beans, per sugar bag	1s. to 2s.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	9d. to 1s. 3d.
Chocos, per quarter-case	...
Cucumbers, per dozen	6d. to 9d.
Custard Marrows, per dozen	6d. to 1s.
Vegetable Marrows, per dozen	6d. to 1s.
Lettuce, per dozen	9d. to 1s.
Peas, per sugar bag	3s. 6d. to 8s.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	...
Sweet Potatoes, per cwt.	12s.
Table Pumpkins, per dozen	2s. 3d. to 6s.
Tomatoes, per quarter-case	1s. 3d to 3s.
Turnips, per dozen bunches	8d. to 1s.
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per case	8s. to 10s.
Bananas (Fiji), per case	15s. to 16s.
Bananas (G.M.), per bunch	16s. to 17s.
Mandarins, per case	..
Mangoes, per case	6s. to 10s.
Oranges (Navel), per case	...
Oranges (other), per case	...
Passion Fruit, per half-bushel case	5s. to 9s.
Lemons (Local), per bushel case	12s. to 18s.
Papaw Apples, per double-case	...
Persimmons, per half-case	3s. 6d.
Pineapples (Queens), per double-case	5s. to 8s.
Pineapples (Ripleys), per double-case	5s. to 6s.
Pineapples (Common) per double-case	5s to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Cucumbers, per case	..

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	MARCH. Prices.
Apples, American, per case	6s. to 7s.
Apples, Cooking, per quarter-case	4s. to 5s.
Apricots, per quarter-case	...
Bananas (Cavendish), per dozen	2d. to 4d.
Bananas (Sugar), per dozen	2d. to 4¼d.
Cherries, per case	...
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	...
Granadillas	...
Lemons (Lisbon), per case	13s.
Lemons (Italian), per case	21s. to 22s.
Limes, per quarter-case	...
Mandarins (Local), per half-case...	9s. to 11s.
Mangoes, per case	6s. to 8s.
Nectarines, per quarter-case	...
Oranges (Navel), Japanese, per case	16s. to 17s.
Oranges (other), Italia.., per case	17s. 6d. to 20s.
Papaw Apples, per quarter-case	1s. 6d. to 4s.
Passion Fruit, per quarter-case	4s. to 6s 9d.
Peaches, per case	2s. 6d. to 5s.
Pears, per half-bushel case	9s. to 11s.
Peanuts, per pound...	3d. to 4d.
Persimmons, per quarter-case	3s. to 5s.
Plums, per case	4s. to 7s.
Pineapples (Ripleys), per dozen	5s. 6d. to 8s. 6d.
Pineapples (Rough), per dozen	2s. 6d to 5s. 6d.
Pineapples (Smooth), per dozen	3s. 6d. to 5s.
Rockmelons, per dozen	3s. to 6s.
Rosellas, per sugar bag	...
Strawberries, per dozen pint boxes	..
Tomatoes, per quarter-case	1s. to 2s. 6d.
Watermelons, per dozen	3s. to 6s.

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1916.

Animal.	FEBRUARY. Prices.
Bullocks	£20 15s. to £30 7s. 6d.
Bullocks (Single)	...
Cows	£12 5s. to £14 15s.
Merino Wethers	45s.
Crossbred Wethers	38s. 3d.
Merino Ewes	26s.
Crossbred Ewes	34s. 3d.
Lambs	32s. 9d.
Pigs (Porkers)	76s.
Pigs (Slips)	20s.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1916.	Feb., 1915.
North Coast.	In.		In.	In.
Atherton	9·83	15	7·06	2·94
Cairns	15·41	34	7·64	5·56
Cardwell	17·13	44	6·33	4·92
Cooktown	13·87	40	4·97	11·00
Herberton	7·37	29	10·48	2·01
Ingham	15·51	24	10 86	8·05
Innisfail	22·44	35	11·85	13·04
Mossman	16·47	5	5·33	4·41
Townsville	12·08	45	7·54	2 81
Central Coast.				
Ayr	9·47	29	7·49	0·39
Bowen	8·76	45	6·85	2·39
Charters Towers ...	4·19	34	8·78	0 95
Mackay	11·78	45	4·92	8·99
Proserpine	10·94	13	8·00	9·13
St. Lawrence ...	8 34	45	2·19	6 68
South Coast.				
Biggenden	3·72	14	4 06	6·10
Bundaberg	6·43	33	5·07	12·81
Brisbane	6·71	65	15·21	8·17
Childers	6·03	21	8·54	10·04
Crohamhurst ...	15·80	22	1·78	19·35
Esk	6·00	29	6·15	7·44
Gayndah	4·29	45	3 62	2·26
Gympie	6·91	46	3·19	8 26
Glasshouse M'tains	8·80	6	2·55	11·84
Kilkivan	5·36	37	2·65	3 85
Maryborough ...	6·74	45	7·44	7 66
South Coast—continued:	In.		In.	In.
Nanango	4·69	34	2·21	4·12
Rockhampton ...	8·15	29	0·73	9·03
Woodford	9·80	29	1·91	15 59
Yandina	12·66	21	4·46	13·97
Darling Downs.				
Dalby	2·94	46	4·45	1·41
Emu Vale... ...	2·28	17	5·78	0·56
Jimbour	3·72	24	2·24	0·37
Miles	2·69	31	3·30	0·70
Stanthorpe ...	3·40	43	4·98	0·43
Toowoomba ...	4·55	44	3·39	4·01
Warwick	3·03	29	4·24	0·14
Maranoa.				
Roma	3·18	42	1·22	0·14
State Farms, &c.				
Gatton College ...	3·35	14	2·26	3·98
Gindie	2·34	13	0·48	0·42
Kamerunga Nurs'y	14·15	27	7·04	5·55
Kairi	5·24	3	4·83	1·33
Sugar Experiment Station, Mackay	9·95	16	6·42	7·51
Bungeworgorai ...	2·55	3	1·40	0·33
Warren	2·80	3	2·08	4·84
Hermitage ...	3·08	7	4·55	0·15

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals or February this year and for the same period of 1915, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE FIRST FOUR MONTHS OF 1916.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·58	5·46
2	4·57	6·45	5·21	6·42	5·42	6·18	5·59	5·45
3	4·58	6·45	5·22	6·41	5 43	6·17	5·59	5·44
4	4·58	6·45	5·22	6·41	5·43	6·16	6·0	5·43
5	4·59	6·45	5·23	6·40	5·44	6·15	6·0	5·42
6	5·0	6·46	5·23	6·39	5·45	6·14	6·1	5·40
7	5 0	6·46	5 24	6·39	5·45	6·13	6·1	5·39
8	5·1	6·46	5·25	6·38	5·46	6·12	6·2	5·38
9	5·1	6·46	5·26	6·37	5·46	6·11	6·2	5·37
10	5·2	6·46	5·27	6·37	5·47	6·10	6·3	5·36
11	5·3	6·46	5·27	6·36	5·47	6·9	6·3	5·35
12	5·4	6·46	5·28	6·35	5·48	6·8	6·4	5·31
13	5·5	6·46	5·29	6·35	5·48	6·7	6·4	5·33
14	5·6	6 46	5·30	6·34	5·49	6·6	6·5	5·32
15	5·7	6·46	5·30	6·33	5·49	6·5	6·5	5·31
16	5·8	6·46	5·31	6·32	5·50	6·4	6·6	5·30
17	5·8	6·47	5·32	6·31	5·50	6·2	6·6	5·29
18	5·9	6·47	5·32	6·31	5·51	6·1	6·7	5·28
19	5·9	6·47	5·33	6·30	5·51	6·0	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·8	5·26
21	5·11	6 46	5·34	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·35	6·27	5·53	5·57	6·8	5·24
23	5·13	6·45	5·36	6·26	5·53	5·56	6·9	5·24
24	5·13	6·45	5·37	6·25	5·54	5·55	6 9	5·23
25	5·14	6·45	5·38	6·24	5·54	5·53	6·10	5·22
26	5·15	6·45	5·38	6·23	5·55	5·52	6·10	5·21
27	5·16	6·44	5·39	6·22	5·55	5·51	6·11	5·20
28	5·17	6·44	5·40	6·21	5·56	5·50	6·11	5·19
29	5·18	6·44	5·41	6·20	5·57	5·49	6·12	5·18
30	5·19	6·43	...	...	5·57	5·48	6·12	5·18
31	5·20	6·43	...	...	5·58	5·47	...	...

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H. M.
5 Jan.	●	New Moon	2 45 p.m.
12 „	☾	First Quarter	1 38 „
20 „	○	Full Moon	6 29 „
28 „	☽	Last Quarter	10 35 a.m.

The moon will be partially eclipsed between 6 p.m. and 7·24 p.m. on January 20th. It will be at its nearest to the earth on the 4th at midnight, and at its greatest distance on the 17th at 3 p.m.

4 Feb.	●	New Moon	2 6 a.m.
11 „	☾	First Quarter	8 20 a.m.
19 „	○	Full Moon	12 29 p.m.
26 „	☽	Last Quarter	7 24 p.m.

The moon will be at its nearest to the earth on the 2nd at 10 a.m., and at its farthest on the 14th at 7 a m. It will pass very close to the Pleiades on the 11th about midnight.

4 Mar.	●	New Moon	1 58 p.m.
12 „	☾	First Quarter	4 33 a.m.
20 „	○	Full Moon	3 27 „
27 „	☽	Last Quarter	2 22 „

The moon will be farthest from the earth on the 13th at 3 a.m , and nearest on the 26th at 11 p.m. It will pass over and occult the bright star, Antares, on the 25th between 4 a.m. and 5 a.m.

3 Apr.	●	New Moon	2 21 a.m.
11 „	☾	First Quarter	12 36 a.m.
18 „	○	Full Moon	3 7 p.m.
25 „	☽	Last Quarter	8 38 a.m.

The moon will be farthest from the earth on the 9th at about midnight, and at its nearest on the 21st at 9 36 p.m It will be near the planet Neptune on the 11th at 7·30 p m., but a good glass will be necessary to see the planet which will be rather more than the width of the moon to the south.

A total Eclipse of the Sun will occur on Feb. 3rd, visible in parts of Central and South America, in parts of the Pacific and Atlantic Oceans, and partially only in Great Britain, France, Spain, &c.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 17 m., 28 m., 36 m., and 47 minutes, respectively, later than at Brisbane at this time of the year.

At Roma 15 minutes may be added to the Brisbane times for January and February, and about 17 minutes for March and April.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice already given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit-fly, and sweat the fruit carefully before packing. If this is done, there is little fear of the fruit going bad in transit, or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil; keep down undergrowth, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done it will probably be moist enough for planting, but should there have been a dry spell, then when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, four to eight gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free sandy loams, that are naturally scrub, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better.

If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked; first, to retain moisture; and, secondly, to prevent injury from frost; as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place, but quickly-acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadilas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast districts being equally applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as, although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district, Mr. Benson, Director of Fruit Culture, recommends the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than

4 cwt. of phosphatic manure, such as Thomas phosphate, or fine bone-bust, per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety—possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

Farm and Garden Notes for May.

FIELD.—During this month the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the Department from the growers, to whom an advance of 1¾d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight will be deducted. Thus, it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass—notably Rhodes grass and Sudan grass—will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass, in the West, will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries

should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta. Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDENING.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned and pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these, as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

FLOWER GARDEN.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SWEET CLOVER.

The cultivation of sweet clover as a fodder for stock has many advocates, but still more adversaries. We lately received the following note on the plant:—

"Sweet clover is now grown for soil-improvement purposes, and as a pasture and forage crop. It does well on any soil, but more particularly on the poorer types, on which it gives a much better result than lucerne, and on account of its biennial character lends itself readily to rotation. The large roots, which penetrate deeply, break up the lower layers of soil, and when they decay, after the second year, add much humus to it.

"Like lucerne it has the ability to obtain nitrogen from the air by means of nitrogen-gathering bacteria which live in the tubercles on

the roots. For quick results in improving the soil it is therefore superior to most other crops.

"The seed-bed needs to be solid and compact, and corn stubble or potato ground is preferable to newly ploughed fields; when ploughing is necessary it must be several months previous to sowing. Fertilisers are unnecessary, but it is best to lime the soil.

"Sweet clover produces early and late grazing, and on account of its vigorous growing habits will pasture more stock per acre than most other pasture grasses. It very rarely causes bloat, and for this reason is preferable to lucerne. Hogs, cattle, horses, sheep, and chickens thrive on it when given a little grain in addition."

In the February issue (1916) of the "Agricultural Gazette" of Canada four pages are devoted to the experiments made with this plant in Nova Scotia, Quebec, Ontario, Saskatchewan, and Alberta, and from the experience so far gained, it does not appear that sweet clover (*Melilotus alba*) is superior to red clover, as is shown by the following table, being the average of two years' experiments in tons per acre of pasture crop at the Agricultural College, Guelph, Ontario:—

Sweet Clover Compared with Red Clover.

Periods of Cutting.	Sweet Clover.	Common Red Clover.
First cutting	11·0 ..	13·5
Second cutting	1·5 ..	1·4
Third cutting	2·5 ..	2·9
Fourth cutting	3·0 ..	4·6
Fifth cutting	1·9 ..	2·0
Sixth cutting	0·9 ..	1·6

These results show that, with one exception, in the average of the two years, the common red surpasses the sweet clover in yield of pasture crop per acre at each of the cuttings. *In the total amount of pasture per acre per annum the common red clover surpassed the sweet clover by fully* 5 *tons, or by about* 25 *per cent.*

Various tests were also made in cutting the sweet clover at different stages of growth for feeding to different classes of farm animals; but, in all instances the animals refused to eat the crop, although, in some cases, it was cut when quite young and tender. The bitter flavour of the crop seemed distasteful to the animals, and apparently, they were not starved long enough to force them to develop an acquired taste. *If the crop is to be used for hay production it seems essential to cut it before any bloom appears.* There seems to be more difficulty in curing hay from sweet clover than from red clover or from alfalfa (lucerne).

The professor of field husbandry, Saskatchewan, reported that the so-called sweet clover (*Melilotus alba*) is a tall-growing biennial plant, having coarse branching stems which bear white blossoms, and, except when young, carry relatively few leaves. It is a "legume," but not a real clover.

UNDESIRABLE QUALITIES.

Sweet clover has several very undesirable qualities. It is bitter, coarse, hard to cure, apt to become an impurity in alfalfa seed, and in waste places may become a weed. . . . . . It is our opinion that *Melilotus alba* will not become a weed on land that is ploughed every year. It carries a large percentage of moisture which makes it difficult to cure, and, in addition, the leaves fall off readily after drying. On account of these difficulties it would seem that, at present, the best use can be made of this crop by pasturing it. It is possible that it may be found useful as a silage crop, but at present no data is available concerning its value as silage.

The seed resembles alfalfa so closely that, if once mixed, the two crops cannot be satisfactorily separated. For this reason the use of sweet clover in possible alfalfa seed-growing centres should not be encouraged.

GOOD QUALITIES.

Among the redeeming qualities of sweet clover are, first, its suitability to the climate; second, its productiveness; third, its biennial character; fourth, it is a legume; and fifth, it may be grown as an intertilled crop. It should not be forgotten, however—(1) that sweet clover is bitter, particularly in the later stage of its development; (2) that it is coarse in texture, and therefore unpalatable, and, in the mature condition, relatively indigestible; (3) that it is hard to cure on account of its large moisture content; (4) that it may become an undesirable plant in alfalfa seed-growing centres; and (5) that much more information must be obtained concerning it before it can be rejected as being worthless, or as being more harmful than beneficial, or accepted as a forage crop suitable for general use.

Mr. H. C. Quodling, Director of Agriculture, Queensland, to whom the question as to the value of sweet clover was submitted, says—"We have *Melilotus parviflora* (Hexham Scent) as a weed in the cereal-growing land in parts of the Darling Downs. *M. alba* grows stronger and is also scented. Both are hardy and I think *well worth leaving alone*. Confined to the improvement of coastal sandy lands, either of the plants might work wonders."

BURNT TIMBER AS A POTASH PROVIDER.

At a meeting of the Inman Valley Branch of the Agricultural Bureau of South Australia last year, amongst the several questions discussed was that of the value of wood ashes as a source of potash. The Director of Agriculture (Professor Arthur J. Perkins) delivered an address which took the form of comprehensive replies to a series of questions submitted by members. The final question was—

"What are the valuable properties in wood ashes, and will it pay to gather them when burning up timber?"

The Director explained that the value of wood ashes varied according to the type of the timber burnt. "The chief useful ingredients in wood

ashes,'' he said, ''are salts of potash and lime. The potash is chiefly in the form of carbonates, and to a less degree in the form of sulphates, silicates, and, occasionally, chlorides. All these potash salts are soluble in water, and are therefore readily available to plants. There are also appreciable quantities of phosphoric acid. It should be noted, of course, that loose heaps of ashes exposed to rain lose much of their value, and that the figures I will give, indicating the percentages of salts present, refer to fresh ashes that have not been leached. From the small number of analyses we possess it would appear that the ashes of Australian timbers are less rich in potash than those growing in Europe. The following are a few examples of the composition of the local timbers:—

	Potash. Per Cent.		Phosphoric Acid. Per Cent.		Lime. Per Cent.
1 Mallee wood ..	2·42	..	0·48	..	40·90
2 Stringybark ..	1·25	..	0·82	..	8.54
3 Red gum ..	5·20	..	3·20	..	35·98
4 Peppermint ..	4·06	..	1·33	..	28·28

''Now, if we try to put a money value on the wood ashes of red gum, which are the richest of the four examples given, we shall base our estimate on 36·38 per cent. super. at £4 per ton on the one hand, and sulphate of potash at £14 per ton on the other. On this basis the value per ton of red gum wood ashes would be about £2 5s. 6d., with about 1,430 lb. of lime (calcium carbonate) thrown in.

''The average dressing of sulphate of potash for soils and crops needing this manure would be about 56 lb. to the acre. On the figures given this dressing will correspond to 10 cwt. of mallee ashes, 19 cwt. stringybark ashes, 5 cwt. red gum ashes, and 6 cwt. peppermint ashes.

''As to whether it will pay settlers to collect these ashes depends altogether on the labour involved in the operation. And with the data I have given I think that each individual should be able to work out this matter for himself. Owing to the abnormal conditions in which we find ourselves, it should be stated that, instead of £14 per ton, as much as £30 per ton is now charged for sulphate of potash. And these prices are likely to continue throughout the duration of the war. In the circumstances, therefore, where potassic manures are required it seems certain that the collection of ashes will prove remunerative.''

A CHEAP SILAGE MATERIAL.

In our issue of January last we published a paper on silage by Mr. Arthur Jones, senr., of Bondoola, Rockhampton, which has attracted much attention amongst the dairying community. Mr. Jones now writes:—'' It has occurred to me since writing *re* ' Cheap Silage,' that many who read it may think that the maize stalks, at the stage to which they had arrived, had lost most of their food value, and, as this is a very important point, I would like to enlarge on it. The usual system is to cut the maize at a very immature stage, or to cut it at the time when the cobs are full grown, but with the grain on the cobs not far

enough advanced to pull them for grain. At this former stage the stalks are at their best, but it is doubtful if grain on the cobs does not deteriorate or lose more or less of its value by fermentation in the silo. By the method we adopted, the cob was left a few weeks longer until the grain was mature, and then, after pulling, the stalks were allowed to lie by for a few days in the sun to dry, sufficiently to cart and spread, say a foot deep, to dry on the floor. If rain should fall during the time it is in the field, it would not receive any injury, if it were not left too long lying on the ground, provided sufficient stalk were left to form a layer and the cobs placed on it to keep them from the ground; thus it would take a very considerable time before it would be injured in the least. If the stalks are cut as soon as they have reached the above stage, they may have lost some of the nourishing qualities from the lower joint, and this may be easily tested. If it has lost none of its sweetness, it has not lost anything. It is not generally known that maize stalks come first to maturity, or to their best food stage, in the length between the bottom joint and the next, extending upwards as it matures, and that it should never be cut for silage until several joints are sweet as in the case of sugar-cane, and this can easily be tested by cutting and tasting. To cut earlier is to lose much of the food value. This is a mistake which is frequently made, in that the greenness and sap are mistaken for food. As the maturity commences at the stalk bottom, so it is that at this part deterioration or loss of food value commences. If, as suggested, the whole plant is left until the cobs are mature, the stalk may have lost its sweetness and become woody in the spaces between the first or second and third joints, but it would still retain its full food value above that, and some food value even in those parts. I would much prefer to leave stalks standing until the stage indicated than to cut them, as they very frequently are cut, before they have arrived at their maturity, independent of the gain made by having the grain to sell or use."

It should be stated that the silage stack mentioned in Mr. Jones's first article was built at Mr. Redland's farm, Barmoya, one of the best maize-growing districts in the State.

PICKLING WHEAT—A REMINDER.

Last wheat season the presence of smut (bunt) in many commercial samples of wheat was sufficient to indicate that a number of growers failed to protect their own interests by neglecting to "pickle" their seed. As the present sowing season is at hand, the following brief notes are given as a reminder:—

The efficacy of any method of treating wheat depends on the removal of the small, dark-coloured smut (bunt) balls, or in breaking them up so that the spores of the fungus can be acted upon and their vitality destroyed. These spores are microscopic in size, and, although wheat may appear to free from infection, it is advisable always to take precautionary measures, otherwise these spores (seeds) germinate at

the same time as the wheat plant, and exist in their tissues, ultimately forming in the matured plants those dark-coloured, smutty ears which give rise to the synonym "stinking smut."

For obvious reasons, sellers of smutted wheat have to suffer a reduction in the market price of their grain.

DIRECTIONS FOR PICKLING WHEAT (BLUESTONE AND LIME TREATMENT).

Mix 1 lb. of bluestone or copper sulphate with 5 gallons of water in a wooden or glazed earthenware vessel. Suspend the bluestone in a bag just below the surface of the water and leave overnight. Iron or metallic vessels are not suitable for bluestone mixture. A hogshead is to be preferred. Rig up a fork and lever alongside of the tub to facilitate lifting of the wheat in and out of the tub. Use an open-mesh jute bag (bran bag) for dipping. The secret of dipping is the rapid and even dipping of each grain, and to secure this, agitate the grain whilst it is in the pickling mixture. Three minutes is sufficient for dipping, after which, the bag should be allowed to drain on two pieces of scantling, allowing the drainings to run into the pickling tub.

Lime Solution.—Quicklime, 2½ lb. Slake the lime in a small vessel with sufficient water to reduce it to the consistency of cream, and add it to 22 gallons of water. A clean iron vessel may be used for this.

Transfer wheat from the bag in which it was dipped into the bluestone mixture to a similar open-meshed bag and dip in the lime solution for 2 minutes. Drain and dry thoroughly by spreading in thin layers on bags or tarpaulins.

By dipping into lime water, or, as an alternative, shaking and mixing air-slaked lime or sifted wood ashes over the pickled seed (after draining), the caustic action of the bluestone is checked. Even for immediate sowing, the drier the wheat is, the better it will be for drilling. When it is purposed, after pickling and treatment with lime water, to keep wheat for any time before sowing, it should be thoroughly dried out previous to rebagging.

Another method of pickling wheat is to empty a few bags of seed on to a wooden or concrete floor and sprinkle the grain with a strong solution of bluestone (10 per cent.), whilst it is being turned over and over by means of two men shovelling in unison until each grain appears to be evenly moistened.

A 10 per cent. solution is made up by using 1 lb. of bluestone for every gallon of water.

Solutions of this strength are apt to destroy or weaken the germinating capacity of a considerable percentage of grain unless the seed is sown immediately after treatment. If it is purposed, on the other hand, to keep the seed for any length of time before sowing, it should be sprinkled with air-slaked lime, and the grain turned over and over until it is lightly and evenly coated with it, and thoroughly dried.

To prevent reinfection of grain, dip all bags used for conveying seed after pickling in bluestone mixture, and dry in the open.

A BY-PRODUCT OF COTTON IN THE UNITED STATES OF AMERICA.

The short cotton ahering to Upland cotton seed, which is not removed by the cotton gin, is called "linters," and is removed by a gin specially adapted to the purpose. The percentage of linters obtained from this year's crop in America is the largest obtained from any previous crop, and is computed at 1,000,000 bales. The average weight of the American cotton bale is 520 lb. of clean cotton. Linters are worth about 3s. per cwt., ginned Upland cotton being at from 6½d. to 7d. per lb. Thus the 1,000,000 bales of linters would amount in value to over £696,000. Many thousands of pounds of these linters were, together with the cotton seed, thrown away by the Queensland ginners when cotton-growing was booming here, and Uplands cotton was bringing up to 2s. per lb. in the Liverpool market. Should cotton-growing again be largely undertaken by Queensland farmers—as we have reason to hope that it will—the value of the by-products will assuredly not be lost sight of by the ginnery owners, in which case the growers would participate in the increased profits derived from them.

AN OLD WHEAT STACK.

In April, 1908, we gave an illustration of a stack of wheat which at that time had been standing for thirty years on Mr. Selby's farm in Lincolnshire. This is the same stack, a further account of which is given in "The Farm" (March, 1916), Adelaide. It was stated in our notice of the stack that no rat had even touched it during that lengthy period.

"Thirty-four years ago" (writes "The Farm") "Mr. Phillip Selby of Aisby, South Lincolnshire, England, harvested a field of wheat, and

PLATE 14.—A REMARKABLE WHEAT STACK.

when the harvest was over he declared he would not thrash it until it had attained a certain price. What that price was no one ever knew but himself, not even his nearest relative, and about a year ago Mr. Selby died, taking his secret with him. The stack contained the produce of about 9 acres. On half a dozen occasions, at least, it has been thatched. Often was the owner twitted by his fellow-farmers regarding the stack, but Mr. Selby was obdurate, and to this day, had he lived, that stack would probably now be standing. Succeeded in the business by his son, however, the latter decided that the old stack would be thrashed, and, although thirty-four years have elapsed since it was harvested, the grain was found to be in excellent condition. The London 'Field' stated that Mr. H. Bell, of Grantham, bought the wheat for 60s. per quarter last August, and the delivery has proved to be about three quarters to the acre, the corn being exceedingly fine, weighing about 60½ lb. to the bushel. Mr. Bell declares it is better than any he has milled for thirty years. The purchaser has had some of the wheat made into bread, and very good it is. It is questionable whether any parallel can be found in the annals of British agriculture, and our contemporary expresses the hope that a sample of the wheat may be preserved at some agricultural college or museum for the edification not only of the present but of future generations."

MARKET GARDENING.

TOMATO WILT.

This disease of the tomato is a bacterial blight. The attacked plants wilt suddenly and, after a time, leaves and stalks become discoloured and die. The disease is mostly spread by inoculation caused by the bites of insects. The organism causing the trouble is believed to be present in the soil, from which it spreads to the plants. Sour soil aggravates the evil.

The first step to take is to spray with a poisonous mixture and destroy those insects which move from plant to plant, thus spreading the disease. One ounce of Paris Green in 10 gallons of Bordeaux Mixture will effect this. Carefully dig round the diseased plants, and prevent the spread of the web-like fungus which extends its meshes from plant to plant underground, boring directly into the healthy cortical cell, and thus giving entrance to the bacteria.

To prepare Bordeaux Mixture, use 6 lb. copper sulphate, 4 lb. quick lime, to be freely slaked, and 22 gallons water. Dissolve the bluestone in 10 gallons of water, make a whitewash with the lime, and strain to separate the grit, and bring the milk of lime to 10 gallons. Mix these up to 22 gallons. Use only wooden or earthenware vessels. When the foliage is out use the half-strength mixture by diluting in double the quantity of water. To make sure that the mixture is safe to use on tender foliage, insert a new nail or the blade of a penknife for at least half a minute; if copper is deposited on the steel, more lime must be added.

Pastoral.

SHEEP ON COASTAL AREAS.

By W. G. BROWN, Instructor in Sheep and Wool.

In the April number of the "Queensland Agricultural Journal" appears a very interesting article on "Sheep in the Burnett District." From this article it is easy to see that "Briny" has known sheep in coastal areas for many years.

In this case, the Burnett district is under review; consequently, this article is valuable, coming as it does from one who knew it when the sheep were giving way to cattle. One of the chief difficulties I experienced when I began to look into the question of "sheep for the coastal areas," was to get authentic and intelligent information as to the cause of the wholesale exodus of sheep away from coastal lands in former days.

As I have stated elsewhere, I found that the chief causes of the failure were—

1st. Unsuitability of the natural grasses.

2nd. Parasitic diseases.

3rd. "Scald-foot," misnamed "foot-rot."

4th. Unsuitable sheep.

5th. Low prices for mutton and wool.

6th. The stocking up of the finest natural pastures in Australia—the Western country of Queensland.

In reviewing the article, I am placing the views I hold as to failure in the past first, because I can take "Briny's" statements and compare them with those enunciated. He has thrown a welcome light on some of the problems which exist to-day on the keeping of sheep on coastal areas.

Taking, then, "Briny's" statements in their order, I notice that he says—

"After inquiry from old settlers, shearers, &c., I find that, although it is fully given as a reason to-day, worm trouble was never mentioned ten years ago as a cause of sheep leaving the Burnett in the early days."

Now, most of my inquiries from pioneers, old shearers, and others, elicited that "bottle-jaw" was prevalent in the old days in most coastal areas. "Bottle-jaw" is symptomatic of anæmia in sheep, and anæmia (or lack of blood) is caused by stomach worms in sheep in most cases. I therefore concluded that worms must have been prevalent in sheep in the past.

"Briny" himself says: "Worms were probably present, and were possibly at times an unrecognised cause of mild trouble, but it is certain . . . that under conditions of shepherding *over large areas* (the italics are mine) in which sheep were then kept, they were not affected

with worms to anything like the disastrous extent they were infected . . . when paddocked in small areas, heavily stocked."

Granted. Yet I know of areas in Western Queensland, where the paddocks are not less than 4,000 acres in area, so heavily infected with worms that the sheep were withdrawn and cattle placed on them. A very essential part of my instruction to farmers is that the keeping of sheep on coastal areas must be confined to such country which may either be cultivated or laid down with artificial grasses.

One very good reason for this is the comparatively high prices for land—prices which, year by year, are increasing far beyond values which would give an adequate return for mere grazing on natural grasses, even if they were suitable for sheep.

If these lands would pay at the price to graze on natural grasses, it would involve the use of comparatively large areas.

I am of opinion that a holding of, say, 320 acres of good land laid down in Rhodes or paspalum, and cut into small paddocks of not more than 20 acres each, will carry not fewer than six sheep to the acre. I know of one place at Maleny, Blackall Range, where 160 sheep have been running for fourteen months on 16 acres of paspalum. This place belongs to Mr. James Cork. The sheep were prime fat when I saw them four weeks ago.

I know of several places on the coast where the dairy stock was on agistment, yet the sheep running on them were fat. "Briny's" instances of selectors who kept sheep successfully for three years, only to fail through worm troubles, is very interesting; but I would like to point out that worms do not come spontaneously on any country. They must first have been introduced. If one sows land with wheat, one expects to obtain a crop of wheat many times greater than the amount of the seed sown. Similarly, if one sows land with the seed of worms—*i.e.*, eggs—it can only be expected that a very much larger crop of worms will eventually develop.

It is beginning at the wrong end to drench sheep on land already infested. The sheep should have been cleared of worms before being put on to the clean land they infected afterwards.

There is another point in the article in regard to worm troubles. "Briny" says—". . . after being six months in paddocks, 350 of the poorest of these sheep were travelled to the Darling Downs. So poor and worm-ridden were they that the owner was much criticised for even starting them. They, however, improved from the outset, and this in spite of the fact that the greater part of the route lay through sheep-condemned country. So greatly had they improved, that they sold for 3s. per head in advance of their original cost in the same 'state of wool.' " The assumption is, of course, that by escaping from the small, over-stocked, worm-infested paddocks, they had escaped from the worms. That certainly was not the main reason for the improvement, for the sheep took their stock of worms with them, dropping eggs, incidentally, all along the route they travelled. This is the real reason.

Many sheepmasters on wormy country believe that when there is a flush of green and nutritious food all danger from worms disappears, because the green feed clears the parasites out of the sheep's system. This is not so, as may be easily shown.

Stomach-worms in sheep live on the blood drawn from the veins of the fourth stomach of the animal, where they are attached soon after being taken up in the grass of infected pastures, to stay during the life-time of the worm or its host.

It is obvious that if the worms are sufficiently numerous the sheep will die from loss of blood or anæmia.

If, however, highly nutritious food be given the animals suffering from worm invasion, and which have been living on short commons in an overstocked paddock, more and better blood is at once produced in the animal.

As soon as the sheep can keep himself and the worms with which he is infested, with a full supply of blood, he immediately begins to improve in condition. As he keeps on assimilating good fodder, he makes more and more blood and reaches a good condition of health.

He is keeping the worms in blood, and is also keeping himself in condition, because he is getting such good food that he has a surplus of blood for the use of his own economy. But—and here is the application of the above—the moment the food falls below what will keep sheep and worms too, then the sheep loses blood until he dies.

That is why weaners die much sooner than older sheep. They have not the reserve of strength to oppose loss of blood, such as mature sheep possess.

It is certainly not "natural," as "Briny" states, "that sheep should have stomach-worms in limited numbers." If sheep possess worms in limited numbers, it is quite certain that, given moisture and warmth, it will not be long before they possess worms in unlimited numbers.

This *in re* worms will explain why, when sheep range over a large extent of country, and can pick and choose their feed, they do not apparently suffer from worms. Yet the sheep may be, and probably are, full of worms.

Of course, as "Briny" states, the article is dealing only with natural grasses in open forest land. The principles, however, both for natural or artificially grassed land are alike. If land can be procured in any part of Queensland at a cheap rate (not exceeding £2 per acre for the best), the natural grasses will give a good return if grazed intelligently. When land rises above that price (£2 per acre), the plough *must* go in or artificial grasses must be laid down for any class of stock. Limitation of space precludes a greater extension of this article, so I shall conclude with my *credo* in regard to "Sheep on Coastal Areas."

I believe that the great bulk of the land on coastal areas, from the Tweed to Rockhampton (perhaps further North), is very good, pos-

sessing, as it does, a better average rainfall than, say, the Darling Downs. Anything which feeds sheep may be grown to advantage.

I believe that paspalum or Rhodes grass will feed at least six sheep per acre.

I believe merino sheep in their purity to be unsuitable to coastal conditions and high-priced land. They are slow maturers, delicate feeders, and have not as much sense as long-wool or their crosses.

I believe that the enormous areas of scrub and other lands on coastal waters will, before many years, support millions of sheep and fat lambs.

I believe that the business will be most profitable to comparatively small holders. One man can easily attend to the wants of 1,000 sheep, excepting at shearing time.

And I *know* that one good crossbred ewe will give £1 sterling per annum in lamb and wool at prices lower than obtain to-day.

In conclusion, I have to thank "Briny" for an informative and lucid article. If I have differed in my conclusions on the evidence he offers, and upon which he forms other conclusions than mine, it is not from any spirit of opposition or controversy, but to endeavour to say the truth as it appears to me.

SHEEP IN THE BURNETT DISTRICT.

Mr. E. H. Goodwin, of Sunny Vale, Mount Larcom, commenting on an article on " Sheep in the Burnett District," which appeared in our April issue, writes:—

" I do not think that the worm trouble was very great, except on the poorer and more sandy runs. I was on Ban Ban in 1865, which then carried between 30,000 and 40,000 sheep, and neither worm or foot rot gave any great amount of trouble. I made three trips with wethers from Ban Ban to New South Wales, and we had no excessive losses.

"Later on I was on Wigton and Culcragie, and both these runs are on sandy and poor country, and I have killed sheep with the stomach full of worms, and also had considerable trouble with foot rot. At another time 'bottle' was prevalent among these flocks. I think, however, that the main cause of sheep leaving the Burnett was the spread of spear grass. Eidsvold was completely ruined by this grass.

" The Burnett sheep always improved very quickly when they got to the saltbush country in New South Wales, and, if they were badly infested with worms, it is evident that change of diet relieved them of the trouble, and the better the diet the less chance for worms. This shows that small paddocks will carry sheep well, provided the diet is good

enough, but that on poor sandy country the sheep has no chance of doing well no matter how large an extent of run it may have. I do not pose as a sheep expert, but my advice to farmers is, to feed their sheep generously, and never lose sight of the obvious fact that sheep are *not* goats.''

SHEEP ON THE COAST.

The accompanying illustration depicts the progeny of ewes bred on coastal scrub land at Eumundi by Mr. Munro Hull. These lambs are just five months old, and their appearance is good evidence that sheep of the right breed, fed not exclusively on native grasses, but on lucerne, paspalum, Rhodes, and other artificial grasses, will thrive and pay the sheepowners in the coastal areas. The number of sheep on these lands, we are informed, is rapidly increasing, and Mr. W. G. Brown, Instructor

PLATE 15.—CROSSBRED LAMBS, FIVE MONTHS OLD, BRED AT EUMUNDI, BLACKALL RANGE.

in Sheep and Wool, who has devoted much time to the study of the successful rearing of sheep on country for years considered quite unadapted to sheep-breeding, has so clearly demonstrated the possibility of the industry on the coast, that it has been said by some that ere long there will be tens of thousands of sheep on farms now hardly cultivated except by dairy farmers and sugar and arrowroot growers; and, in short, the coastal areas bid fair to become the New Zealand of Queensland, if not of Australia.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1916.

Four thousand five hundred and seven eggs were laid during the month. The final result of the competition is a tie between Messrs. Bertelsmeier and Nicholson, with 1,530 eggs each. A. H. Padman takes third place with 1.481 eggs to his credit. S. Chapman wins the monthly prize with 123 eggs. A full report on the whole competition will be issued in due course. The following are the individual records:—

Competitors.	Breed.	March.	Total.
C. B. Bertelsmeier, S.A.	White Leghorns ...	107	1,530
J. D. Nicholson, N.S.W.	Do.	115	1,530
A. H. Padman, S.A.	Do.	77	1,481
A. W. Bailey	Do.	88	1,451
Mrs. Munro	Do.	74	1,446
J. M. Manson	Black Orpingtons ..	97	1,445
J. R. Wilson	White Leghorns ...	81	1,441
E. F. Dennis	Do.	87	1,440
W. Parker	Do.	104	1,437
J. Gosley	Do.	83	1,433
King and Watson, N.S.W.	Do.	96	1,429
Kelvin Poultry Farm	Do.	88	1,427
J. M. Manson	Do.	74	1,425
Jas. McKay	Do.	85	1,425
H. Hammill, N.S.W.	Do.	100	1,423
C. Knoblauch	Do.	97	1,417
E. A. Smith	Do.	105	1,413
A. T. Coomber	Do.	91	1,412
T. Fanning	Do.	100	1,407
W. Purvis, S.A.	Do.	108	1,405
Moritz Bros., S.A.	Do.	112	1,384
E. A. Smith	Black Orpingtons ..	112	1,381
R. Burns	Do.	105	1,373
W. Lindus, N.S.W.	White Leghorns ...	113	1,372
O.K. Poultry Yards	Do.	68	1,369
T. Fanning	Black Orpingtons ...	78	1,355
J. H. Gill, Victoria	White Leghorns ...	111	1,354
C. T. Clark	Do.	79	1,351
Cowan Bros., N.S.W.	Do.	82	1,343
Mrs. Jobling, N.S.W.	Black Orpingtons ...	60	1,340
E. V. Bennett, S.A.	White Leghorns ...	71	1,337
R. Burns	S. L. Wyandottes ...	106	1,330
S. E. Sharpe	White Leghorns ..	82	1,315
Geo. Tomlinson	Do.	93	1,315
E. Le Breton	Do.	81	1,309
F. Clayton, N.S.W.	Do.	50	1,392
W. Meneely	Black Orpingtons ...	79	1,286
R. Jobling, N.S.W.	White Leghorns ...	82	1,283
Derrylin Poultry Farm	Do.	71	1,280
Cowan Bros., N.S.W.	Black Orpingtons ...	81	1,273
J. G. Richter	White Leghorns ...	74	1,267
S. Chapman	Brown Leghorns... ...	123	1,260
Loloma Poultry Farm, N.S.W.... ...	Rhode Island Reds ...	83	1,255

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	March.	Total.
W. Lyell	White Leghorns ...	65	1,244
G. H. Turner	Do.	82	1,234
J. Zahl	Do. (No. 1)	75	1,228
J. Zahl	Do (No. 2)	75	1,201
F. Clayton, N.S.W.	Rhode Island Reds ..	103	1,186
R. Jobling, N.S.W.	S. L. Wyandottes ...	66	1,176
J. Aitcheson	White Leghorns ...	46	1,172
E. Pocock	Do.	59	1,154
W. H. Forsyth, N.S.W.	Do.	73	1,141
J. R. Johnstone	Plymouth Rocks ...	30	871
Totals	...	4,507	70,848

NEW GUINEA BUTTER BEANS.

There are few, if any, purely tropical plants which will not thrive to perfection in some portion of Queensland. The mangosteen, which is a native of the hottest climates, such as Java, parts of India, and other such countries, and which for years defied all attempts to acclimatise it, has been successfully grown at the Kamerunga State Nursery, and has borne excellent fruit. Another tropical plant, the New Guinea butter bean, thrives well in the coast districts. How well, is shown in the accompanying photograph of the bean growing on a trellis, on the property of Mr. Charles Collins, M.L.A., at Gympie. We are informed that several of the beans were over 3 ft. in length and weighed up to 13 lb.

PLATE 16.—NEW GUINEA BUTTER BEANS.

The Orchard.

NOTES ON THE DYING OF CITRUS TREES.

BY ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

In consequence of the many complaints that had been received by the Department of Agriculture and Stock of citrus trees dying in different parts of the State, and particularly in the Wide Bay District, I took the first opportunity after my return to this State, of making a personal inspection of some of the affected orchards, as the matter was considered to be one of great importance to the fruit-growing industry and to require immediate attention. As a result of my personal investigation I realised the serious nature of the trouble, and was of the opinion that it was of a very complex nature and probably due to several causes of a more or less obscure origin. This being so, I recommended the carrying out of a very complete and systematic investigation to determine—Firstly, the cause or causes of the trees dying; secondly, the means to be used to stop the spread of the present trouble; and thirdly, the means to be adopted to prevent its recurrence.

My suggestions were approved, and it was decided to commence the investigation by making a careful soil survey of the affected areas. The carrying out of this work was placed in the hands of Mr. F. Smith, B.Sc., F.I.C., of the Chemical Branch of the Department, and this officer has recently submitted a long and valuable interim report on the work already accomplished, including numerous anlyses of soils and waters, biochemical tests, &c. Many of the matters dealt with by Mr. Smith are still under investigation; consequently it is premature to refer to them at present, but there are others, including the incidence of gumming and root rot, on which he throws considerable light. Mr. Smith has also arrived at certain conclusions, and has made several suggestions from which I will quote fully, as, in my opinion, they are worthy of the careful consideration of all citrus-growers. When dealing with the general aspect of the question Mr. Smith states:—

"The relation of plant disease, especially parasitic disease, to conditions of soil environment and nutrition are not entirely known.

"Potter, however ('Science Progress,' No. 18, October, 1910, page 207), states that 'the external conditions to which any plant is exposed have an important bearing on its general health and render it more resistant or more susceptible to parasitic attack.' Temperature, air, and moisture content of the soil and the nature and supply of food constituents are all factors necessarily affecting the general vigour of any host plant.

"With regard to manurial treatment, there is considerable evidence that susceptibility to disease is influenced by the nature of such, and that abundant fertilisation, especially with nitrogenous manures, renders the host less resistent to disease. Generally, phosphate manures induce a high degree of resistance.

"In addition to the nutritional influences indicated, there may exist as conducing causes, unfavourable physical circumstances due to deficiency of drainage owing to formation of hard pan or presence of impervious subsoil, and to deficient æration owing to surface packing; general poverty induced by deficiency of plant food or disturbance due to the presence of bodies toxic to plants in the soil.

"It has been impossible, without data derived from previous mycological investigation, to decide where 'gumming' is to be attributed to parasitic attack, or is evidence of transitory physiological dusturbance due possibly to climatic conditions. There is sufficient evidence to show that 'gumming' is apt to be prevalent in otherwise healthy and vigorous orchards during periods of protracted drought, and is stayed on advent of more favourable meteorological conditions.

"It is possible to ascribe such evidence to purely physiological causes attendant upon the operation of a set of climatic conditions upon peculiarity of constitution, and either the remedy adopted, scarification of the bark, or the normal resumption of active growth is effective in staying the pathological condition by diversion of the nutriment of the sap to production of new tissue—the explanation advanced by Prilleux (M. Prilleux: 'The Production of Gum in Fruit Trees considered as a Pathological Phenomenon,' Comptes Rendus for 1874).

"Considered as evidence of parasitic invasion the same remedy, if promptly applied with treatment of the affected part with disinfectant, is liable to be efficacious by removal and destruction of the organism.

"This means of check appears to have been successfully resorted to in many instances both in the Maryborough and Burrum River orchards.

"Considering all manifestations of gumming as following parasitic invasion, instances of apparent natural recovery are ascribable to the triumph of the host over the parasite due to causes favouring the former.

"Persistent gumming of the stems and branches has sometimes necessitated the cutting off of the tree at ground level when the new growth has been found not to manifest the trouble.

"It appears to be necessary in the case of 'root rot' to distinguish between the condition affecting the roots of certain young trees and that leading to the destruction of the root system of aged orchards. The former is localised and comparatively unimportant in its results, and is regarded as accidental rather than incidental.

"Effective remedial measures have been the removal of affected roots and treatment with tar and lime. The writer is not certain if similar treatment has been tried in the cases of first manifestation of the more important 'root rot' of mature trees.

"With regard to the incidence and comparative incidence of 'gumming' and 'root rot,' it is apparent that—

"1. Root rot may occur without previous marked evidence of gumming.

"2. Root rot is an affection of aged trees.

"3. Root rot comparatively speedily affects considerable areas and more or less rapidly effects the destruction of trees thereon.

"4. Gumming affects trees at an earlier stage of their growth and occurs sporadically—a condition probably indicating variation in susceptibility with peculiarity of constitution.

"5. The rapid spread of root rot over areas indicates the infection of the soil in areas.

"6. The sporadic incidence of gumming (referring to that consequent on parasitic invasion) may indicate non-conveyance of infection by air, but rather by some accidental means.

"The writer, however, does not wish to express definite opinions upon these heads, the questions raised rather appertaining to mycological study, but it would appear that they must be given due consideration in deciding to what extent incidence of disease can be co-related with soil and environmental conditions.

"Apart from the question of means of infection or the specific nature of existent disease it must be held that faulty soil conditions, where prevalent, may be considered as directly contributive to its virulence and spread.

"Attention has, therefore, been directed to the condition of virgin, non-affected, and affected areas for the purpose of showing both the original capabilities and properties of the soils and the change produced by the systems of management adopted, and to reveal such differences between healthy and diseased areas as will contribute to the elucidation of their respective conditions."

Referring to the chemical and biochemical analyses of the Melrose and contiguous soils, Mr. Smith remarks:—

"Chemically there is nothing inconsistent in composition with that of recognised good citrus types in which ideal physical condition is a greater desideratum than supplies of plant food considered necessary for ordinary and rapidly growing farm crops.

"It is significant that the slow progress of disease in the Melrose orchards would characterise the soils as inherently suitable for the normal and healthy development of citrus trees.

"It is probable that general potash and phosphoric acid manuring might be of benefit to orchard trees in heavy bearing. The maintenance or increase of organic matter content might also be advisable by systematic green manuring, especially on individual soils, for the improvement of tilth, and in soils of lighter type as an aid in the conservation of soil moisture.

"It is more apparent that the life-history of a tree, especially its previous prolificness, is a determining factor in its susceptibility to the prevalent root and gumming diseases.

"The Melrose orchards were noted previously for their heavy bearing capabilities, whereas trees on neighbouring areas allowed to go out of bearing through neglect, though of equal age and prone to the ravages of scale pests, remain disease free, providing, however, their position does not preclude the possibility of infection.

"For this reason stimulation to production by heavy fertilisation is not to be recommended, but rather systematic manuring by light applications of less soluble manures. Applications of nitrogenous fertilisers are to be guarded against, even in the unlikely contingency of their proving immediately economic."

Referring to the same matters in the case of the Burrum soils, he also states:—

"The data point to marked alteration in the biochemical condition of long-cultivated soils in the direction of diminished nitrifying power, indicative of deficient or abnormal nitrogen—nutrition, and much lessened oxidative efficiency.

"Both may be considered as possible conducive influences in disease incidence.

"The former effect indicates the highly probable beneficial influence of liberal treatment with forms of lime; the latter may be co-related with the loss of valuable organic forms under cultivation.

"Systematic green manuring, however, is the course to be most confidently recommended for the amelioration of the serious soil deterioration indicated, and obviation of the tendency of the heavier types to surface packing, but it is to be emphasised that no course of manurial treatment will be effective in eradicating the prevalent disease, though improvement of nutritional environment is likely to check its virulence and spread.

" In this connection it would appear that the progress of disease has been more rapid on the Burrum soils, where deterioration of soil condition has occurred, than on the citrus soils of the Melrose area, where no such 'working out' is indicated."

In concluding his report, Mr. Smith summarises the result of his investigations to date as follows:—

" 1. Considering the parasitic nature of the disease prevalent in the areas visited, it is not possible to assign unfavourable soil or environmental conditions as primary causes.

" 2. It is possible, however, to recognise in conditions unfavourable to normal vigorous or healthy growth, causes contributing to susceptibility to disease.

" 3. These may be physical—viz., deficient drainage, water supply, or aeration; chemical—viz., deficiency of the elements of plant food; and biochemical—viz., lack of normal bacterial life for presentment of adequate and acceptable forms of food supply to the plant for promotion

of normal sustained and vigorous growth, and absence of revivifying power due to catalytic oxidation of plant toxins.

"4. An important contributory factor is considered to be heavy bearing with consequent constitutional change predisposing to disease.

"5. The soils of the Melrose area present no features to be definitely considered as adjurant causes. Ameliorative measures recommended are: Maintenance or improvement of physical condition for preservation of free aeration, and conservation of moisture for maintenance of growth through periods of drought. Stimulation of productive function by heavy application of readily available fertilisers is to be avoided.

"6. The soils of the Burrum River orchards evidence marked deterioration under long cultivation—a loss of condition that is considered contributory to the incidence and spread of parasitic citrus disease.

"The principal ameliorative measure is the maintenance of organic matter content by systematic green or organic manuring.

"7. No system of soil improvement will banish the disease from infected orchards or entirely prevent its invasion of uninfected trees.

"8. The most rational method of attack appears to be removal of badly diseased trees with prophylectic treatment of infected trees and soil disinfection.

"9. The writer would urge the further study of varietal immunity and the prosecution of mycological investigation of the organisms causative of the phenomena of gumming and root rot."

From Mr. Smith's report we may therefore conclude—

First: That the dying of citrus trees in the Wide Bay district is not due to unfavourable soil conditions, as neither the chemical nor biochemical analyses of the soils on which the trees have died show any very marked difference from those of the adjacent virgin land or those of the orchards in which trees have not died, except that there is a decided deficiency in organic matter in some of the Burrum soils; but this in itself would not be sufficient to account for the trees dying.

Second: As the cause of the trees dying cannot be ascribed to faulty soil conditions, it must be looked for in another direction, as recommended by Mr. Smith, as it appears to be more a matter requiring the services of a skilled microbiologist than those of a chemist.

A thorough scientific investigation into the nature and cause of gumming, root rot, twig blight, and other parasitic diseases of a fungoid nature attacking citrus trees in this State, is very badly needed, as very little original research has been undertaken here, and, in consequence, we have had to depend largely on the result of the investigations that have been carried out in other parts of the world under conditions that are very frequently in no way comparable with those existing here. Local investigation must be undertaken, and if, as I trust it will be, started shortly, it will undoubtedly throw much light on several matters pertaining to the treatment of our citrus orchards and of the diseases attacking our citrus trees. Such an investigation, to be of the most benefit to the State, must be of a very thorough and highly scientific

nature, and will take a considerable time to complete, so that, although it is more or less of a presumption on my part, I beg to submit the following remarks and suggestions to the careful consideration of our citrus-growers, as it is possible they may prove of value to them pending the carrying out of the scientific investigations by which alone can we hope to arrive at any finality.

Returning to the general question of the trees dying, I must say at once that I am unable to show what is the cause or what are the causes of the trees dying; but, as I stated in the commencement of this article, I am of the opinion that it is a very complex matter indeed, and is probably due to various agencies acting more or less collectively and bringing about the results that have been experienced.

Although the majority of the trees that have died were in full bearing, and possibly some of them may have reached their natural end—in other words, died of old age, this does not apply in all cases, as older trees are still living where much younger ones have died out. At the same time, the question of old age must be considered, as we have no definite information respecting the longevity of citrus trees in this State to enable us to say exactly how long they are likely to live; and, further than that, there is the probability that the age to which the trees will live depends largely on the soil in which they are planted and the climatic conditions under which they are grown. The more even and regular the conditions of growth the longer the tree is likely to live, and the more it is subjected to sudden and extreme changes the sooner, in all probability, it will begin to fail. The climate of many parts of this State is undoubtedly trying to citrus trees, though they certainly stand very rough treatment and recover when conditions become more favourable. Long dry spells frequently produce a stagnation of growth which is succeeded by an excess of growth when the ground has received a good soaking, and these rapid changes tend to weaken the constitution of the tree and impair its longevity. These remarks are borne out by actual experience, as the districts in which the greatest losses have taken place have irregular rainfalls, whereas in those districts where the rainfall is fairly regular there have been practically no losses, even of trees that are much older than the majority of those that have died out where the rainfall is not so evenly distributed throughout the year.

I am therefore of the opinion that one of the most important steps towards increasing the longevity of citrus trees is the maintenance of a sufficient supply of moisture in the soil at all times to permit of the proper and regular development of the tree. This, in districts where the rainfall is uncertain and irregular, can only be brought about by judicious irrigation, which must be given as soon as the trees show signs of the want of moisture, instead of putting it off, in the hope of rain coming, till they have become seriously injured. The main object is to maintain an even growth and to keep the tree in a healthy condition the whole time. I have, therefore, to advise that, where trees show signs of dying out, systematic irrigation, to provide a regular supply of moisture to the soil at all times when needed, be carried out

wherever practicable. Where water is not available, these growers will have to depend on thorough cultivation, which will enable the trees to stand moderately long dry spells without serious injury, but which will not stand the strain of a drought.

This irregularity in the growth of citrus trees is undoubtedly one of the causes of the trees dying, but it is not the only one, although its effect on the vitality of the tree may be such that it renders it unable to throw off or resist fungus diseases which always accompany the dying out of citrus trees. In other words, the irregularity of growth may be the prime factor that leads eventually to the death of the tree. If this is so, then the importance of maintaining even conditions of growth cannot be overestimated.

The overmanuing of the trees with highly stimulating fertilisers which has taken place in some orchards where there has been serious loss may also possibly account for such loss, as heavy manuring is apt to produce abnormal growth, and unless the manure has been applied at frequent intervals, the growth is irregular; and, as I have previously pointed out, irregularity in growth is conducive to the maturing of the constitution of the tree. Great care should therefore be taken in the use of such manures to see that the trees do not receive an overdose at one time and are lacking food at another; small and frequent applications are therefore preferable to heavy dressings at longer intervals.

Insufficient drainage, which frequently accounts for the dying of the roots of citrus trees, cannot be held responsible for the death of many of the trees, as they were growing in soil possessing perfect natural drainage, in which there would be no possibility of stagnant water accumulating round the roots, though it is probable that, in some instances, it has been a contributing factor, and where such is the case drainage would certainly prove beneficial.

In nearly every instance in which the trees have died there has been more or less gumming—sometimes of the branches and sometimes of the main trunk at its junction with or near the soil, and very frequently both forms of gumming are met with. Usually the roots are badly affected and are killed outright, but in other cases the roots, or at any rate a part of them, are perfectly healthy, and all of the tree above the ground is dead.

In addition to the general advice I have given regarding the importance of maintaining an even condition of growth and of protecting the trees from sudden changes, I am including herein an extract from the fifth edition of my pamphlet on "Citrus Culture" descriptive of the diseases which are always more or less closely connected with the dying of citrus trees, as well as the treatment recommended, as follows:—

WITHER-TIP, DIE-BACK, OR TWIG BLIGHT.

(*Phoma omnivora*), McAlpine.

"This disease, which must not be confounded with the die-back of citrus trees in the United States, is, I am sorry to say, spreading in this State, and has already caused considerable loss. It is an extremely

complex disease, as it takes on many forms and attacks every part of the tree both above and below ground.

"It produces such varied results that were it not clearly shown by microscopical investigation that the damage is due to one and the same fungus in different stages of its development, one would naturally be led to think that instead of one there were several diseases present. As its name infers, this fungus in one state of development attacks the tips of the twigs which, when attacked, die from the top downwards. The affected twigs are covered with slightly raised irregular-shaped, greyish blotches which are conspicuous on the green bark, and soon kill the twig. The leaves show greyish patches which frequently rot away leaving ragged holes, or the edges or tops of the leaves may be destroyed in a similar manner.

"The fruit is covered by brownish or blackish scaly or scurfy patches somewhat similar in appearance to the well-known scab that is common on rough lemons.

"The roots are also affected and die back from the tips until the whole root system is killed (root rot).

"The mycilium (tissue) of this fungus can be found in all parts of the tree, but in the greatest quantity in the growing layer of tissue immediately underlying the back, and I am of the opinion that it will eventually be found to be one of the primary causes of gumming. Further careful investigation is, however, necessary before it is possible to arrive at a definite conclusion, and in the meantime the following treatment is recommended:—

1st—Systematic pruning to remove all dead and superfluous wood, which should be gathered and burnt.

2nd—Spraying the trees with the lime sulphur spray (F) or sulphide of sulphur wash (D); the former by preference.

3rd—The free use of the knife where gum appears and the sterilisation of the wound with carbolic acid: One part crude acid to one part water, or painting the wound with strong solutions of D or F.

4th—The application of from 2 to 4 lb. of lime, or from ½ lb. to 1 lb. of sulphate of iron (green copperas) to the roots.

5th—The sterilisation of all pruning tools by dipping them in a 5 per cent. solution of a 40 per cent. solution of formaline (one fluid ounce of formaline in one pint of water), as the disease is easily carried from a diseased tree to a healthy one by means of the pruning tools. A little care exercised in this respect will do much to check the spread of this disease, and as it entails very little extra trouble or expense it should be adopted by every fruitgrower.

"As already stated, this disease is of a very complex nature and to make it even more so, the fungus *Phoma omnivora* is frequently accompanied by other fungi belonging to Spp. of *Fusarium* and *Coniothecium.* The remedies suggested for the treatment of wither-tip are

those that are likely to prove efficacious in the case of the other fungi, so that no special treatment other than that recommended is needed.

"In addition to the fungi which are always found in connection with wither-tip, la grima (the gumming of the branches, mal di goma (foot or collar rot) and root rot, there are several others which are found on both the large and small branches usually in the form of grey or brownish patches, rough, scabby, or cankerous growths, or of cobweb-like, whitish filaments. The latter rapidly kills the bark and limb, as its mycilium travels along the cambium layer and destroys its vitality.

"If not treated, this fungus soon kills the limb on which it makes its appearance, and not only the limb but sometimes the whole tree. Spraying with the lime-sulphur wash or Bordeaux Mixture in the early stages is a certain cure for these diseases, but before the spraying is done all dead and superfluous wood should be cut away and the centre of the tree systematically pruned out so as to admit plenty of air and to facilitate spraying.

"If the fungi attacking the bark have already commenced to kill the limb, or if they are accompanied by gumming or by a yellow discolouration of the inner bark which exudes a yellowish viscid fluid, then the knife must be freely used. All diseased bark and tissue must be cut away till healthy wood is met with, and the wound must be treated with a disinfectant as already recommended, as must also all tools that have been used.

FUNGI ATTACKING THE ROOTS.

"The treatment for collar rot or mal di goma should start as soon as ever the presence of the disease is detected, as, if neglected, the fungus rapidly girdles the tree, which dies the same as if it had been ringbarked. The first external indication of the presence of this disease is frequently a small spot of gum at or near the surface of the ground, and when this is seen no time should be lost, but the knife should be freely used and all diseased bark and tissue cut away and the wound sterilised. If this is done in time the tree will be saved, otherwise there is every chance of its being killed.

"In addition to the root rot which starts at the end of the roots and eventually kills the whole root system, the roots of citrus trees are sometimes attacked by root fungus (*Armillaria mellea*), the mycilium of which spreads from the decaying roots of the original trees grown on the land to the growing roots of the citrus trees, which become covered with a network of dark-coloured fibres which soon kill the tree. The remedy in this case is to bare the roots and apply either air-slaked lime or firmly powdered sulphate of iron to them. The application of common salt to the roots, a handful to 4 gallons of water, has also been found an effectual remedy. This fungus is not confined to citrus fruits, but attacks the roots of all kinds of fruit trees, hops, &c., and although it has not so far done any very great damage in this State it should always receive attention, as, if neglected, it will kill the tree sooner or later."

Forestry.

OUR FRIENDS THE TREES.

The importance of our forests cannot be too frequently and forcibly brought before the rising generation in the country districts. Some trees are comparatively quick growers; others require many years before coming to maturity. Unthinking people are apt to say: "What is the use of my planting trees? I shall never benefit by them." That may be so, but if our forefathers had acted (or failed to act) on that principle, whence would the vast quantities of timber, such as that of the "brave old oak," been obtained for the building of Great Britain's wooden walls—her ships in the days prior to the advent of the iron ship? Whence would we to-day obtain our great supplies of cork, if the Spanish people had allowed the cork oak to die out? And whence shall the future generation of Australians derive supplies of cedar, beech, eucalyptus trees, such as ironbark, gum, bloodwood, and of many valuable scrub timbers, many of which are being ruthlessly destroyed in the interests of agriculture?

It all depends on what is done now in the matter of reafforestation. No one is too old to plant a tree or trees on some portion of his land not required for cultivation purposes. There is a story of an old man in Devonshire who was planting out some walnut trees. On being asked why he was planting trees which would only produce fruit when his young children had grown into middle age, he replied: "When that time arrives, those children will bless the memory of the old man who left them a valuable legacy."

In the "Hawaiian Forester" for December, 1915, is published a very interesting address by Mr. C. S. Judd, Superintendent of Forestry, at Arbor Day Exercises, Pokuhaina School, Honolulu, which we commend to school teachers in Queensland. Mr. Judd said:—

"Do you know that the oldest living things in our world are trees? The giant sequoia trees of California, and their brothers, the redwoods, which we use here in these Islands for fence posts and water tanks, are the last survivors of a great family of trees which covered a large part of the western world in the past ages when strange and monstrous animals roamed the forest. When Solomon was building his temple about 2,915 years ago, if he had only known it and had had the proper ships, he could have used for the rafters of his temple the giant sequoia of the Sierra Nevada mountains instead of the firs and cedars of Lebanon. Even then, these noble trees, which now tower up into the sky to more than half the height of Punchbowl, were over a thousand years old.

"Aside from this interesting fact as to the age of trees, I want to point out why we regard the trees as our friends and why, for that reason, we celebrate this day by planting them.

"What did you sleep in last night? A wooden house.

"What did most of you sleep on last night? A wooden bed.

"What did you eat your breakfast on this morning? A wooden table.

"What did you sit in while you ate it? A wooden chair.

"What was used in cooking your breakfast? Wood, undoubtedly, in most cases.

"What was used in starting the fire in the stove? A wooden match.

"What was the newspaper which you read this morning made of? And the books which you study in this school? Mostly wood pulp.

"So you see that we must call the trees our friends if we simply consider their usefulness in supplying us with wood for these articles, without which we could not very well get along.

"And besides the value of trees in other countries for producing wood for our use here, let us see how useful are our own trees in these islands. Take the algaroba or kiawe tree alone, which was first brought to these islands about 87 years ago and has multiplied and spread over many thousand acres, so that it is not only a benefit to ourselves, but also to the insects of the air and the beasts of the field. This tree not only supplies us with the wood which we need for cooking and the charcoal which heats our irons when our clothes are pressed, but produces the flowers which furnish pastures for the millions of bees which convert the nectar of the blossoms into honey which we eat on our bread and on our pancakes, and in the dry season when the grass in the pastures is brown and dead it drops the sweet yellow pods which are eagerly devoured by the cattle, horses, and pigs if they can get them before they are picked up by the little children, who take them to the mills, where they are ground up into meal to be fed to the animals later on. And how much more pleasant are parts of our islands on account of the shade which the algaroba trees produce.

"When my father was a little boy and rode from Nuuanu to school at Punahou he had to ride around the makai side of Punchbowl and then across the large, open, wind-swept plains which are now crossed by Beretania street and which in those days had scarcely a tree or a house on them. One day his horse ran away with him and he let him run across this vast, treeless stretch of country, part of which is now Thomas Square, and out beyond until he came to a grassy place near a spring. Here he selected a soft spot and slid out from the saddle safely on to the ground.

"How different these plains are to-day! They are not only thickly covered with streets and houses, but the innumerable trees that have been planted there have changed them from bare, wind-swept flats to

a comfortable residence district, and when you look down upon them from Punchbowl they look like a huge forest and half of the houses cannot be seen on account of the trees.

"We plant trees in the city not only for the ornament which their foliage and flowers produce, and which please the eye, but also for the shade which their spreading branches afford and which protect us from the sun. When you wait on the corner for a street car on a hot day, how pleasant it is to seek the shade of a spreading monkey-pod or royal poinciana, and when a sudden shower comes up, isn't it a tree that you run to for shelter?

"The value of trees for producing wood for a hundred different uses, for producing fuel, and shade and shelter, we unconsciously accept because they minister to our needs and physical comfort in a direct and tangible manner, but there is another way in which the trees when growing together in a community, which we call a forest, are equally as useful, only we do not realize it because their usefulness is exerted in an indirect manner. It is the effect of the trees in the forest on our water supply to which I refer.

"When you drink your glass of clear water you should thank the forests on the mountains not only for offering you refreshing water, but water whenever you are thirsty and want it. If there were no forests on the mountains back of Honolulu, when the rain fell it would rush down the slopes, into the valleys, and out to sea as a mass of dirty water, and in a few days it would all be done. But with our forests on the mountains it is different. The rain strikes the leaves and tree branches and then falls on to the ferns and bushes and finally on to the ground covered with fallen leaves and moss. All of this retards the run-off of the rain water, and the litter on the ground acts as a sponge from which the water oozes out slowly. Water falling on a galvanised iron or shingle roof runs right off into the gutters, but if you covered that roof with moss or gunny sacks you would find that the water would run off much less at a time and would continue for a much longer period. So it is with a mountain-side covered with forest trees. The run-off from the rain is much slower and lasts for a longer time than if there were no forest cover.

"Without the forests on our mountains, our water supply would be much less and of poorer quality, and there would be times when there wouldn't be any water at all. Without our forests, there would not be enough water for irrigating the sugar cane fields, and this industry would not be the mainstay of our islands; there would be little or no rice cultivation, and most of our taro patches would be dry. The freshets would dash down from the mountains a great mass of rocks and rubbish, you would seldom have any clear drinking water, and these islands would be a very unpleasant place in which to live.

"Because the people of China long ago were careless in cutting down most of their forests, to-day in that country there are in the rainy season terrible floods which inundate and destroy the lands and kill many of the people.

"The influence of forests on streams alone, besides preventing floods and drought, therefore, makes the raising of crops possible, and without crops we could not live.

"As man is the most highly organised portion of the animal world, so is the forest the most highly organised portion of the vegetable world. The trees, of which the forest is composed, have functions similar to the workings of the human body. Their roots take water and mineral substances from the soil, which is pumped up to the leaves, which work it over with the aid of the sun and combine it with carbon from the carbonic acid gas in the air, into food which is sent to the living parts in the roots, trunk, and crown to assist in the growth of the tree. This food is digested in the leaves of the tree just as food is digested in the human body.

"So trees may be considered to be almost human. At least they are our friends, as I have told you already, because of what they do for us and supply us with, and they should therefore be treated by us as kind and useful friends. Don't throw sticks and stones up into the trees or break off the branches, and when the young trees which you have planted droop in the hot sun, revive them with a pail of water.

"Just give the trees a start, and they will grow while you are doing other things, and as you get older they will come to be a real benefit and delight and a source of great enjoyment to you."

A POSSIBLE NEW SOURCE OF POTASH.

Judging by the following paragraph which appeared in the "Louisiana Planter" of 4th March, there would appear to be grounds for hope that the world will not be dependent on Stassfurt for supplies of potash manures during or after the war:—

"And now New Mexico is going to beat Germany, at least so the Press despatches seem to indicate. In the Panhandle of Texas, in Oklahoma and New Mexico, Permian red beds have been discovered containing inexhaustible quantities of potash that will make every cane and beet field blossom with abundance, and the land will drop fatness to astonish all planters. At Lesbia, New Mexico, large salt beds were penetrated at a depth of several hundred feet, and they found peculiar red shale and sandstone with a potash-bearing deposit, and that the dip was close to the earth's surface. In 1913, the United States imported 12,000,000 dollars' worth of kali from Germany, and if New Mexico will come forward and cast a hedge about America, guaranteeing that all this money will stay here, generations to come will rise and call her blessed. Here's hoping that the faith has decent substance behind it."

Tropical Industries.

THE INFLUENCE OF RAINFALL AND THE NON-BURNING OF TRASH ON THE ABUNDANCE OF DIATRAEA SACCHARALIS.

The following notes, which may be interesting to sugar-growers in Queensland, are taken from a pamphlet issued by the Board of Commissioners of Agriculture, Rio Pedras, Porto Rico, written by Geo. N. Wolcott, Entomologist, Insular Experiment Station, Rio Pedras:—

The most important insect injurious to sugar cane in the Western Hemisphere is the smaller moth stalk-borer, *Diatraea saccharalis* Fabr., which occurs in abundance in the southern United States, Mexico, Cuba, Jamaica, Santo Domingo, Porto Rico, St. Kitts, Barbados, Trinidad, Demerara, and Argentina, besides other islands and countries of lesser importance in sugar production.

The writer of this article has personally visited all of these countries except Mexico, Santo Domingo, and Argentina, making a special study of cane insects and their parasites, and has been impressed by the notable difference in abundance of *Diatraea* in various places. In an attempt to obtain definite data as to the comparative abundance of *Diatraea*, a form of recording notes adapted from that first used by Mr. W. Dwight Pierce in recording the abundance of the boll weevil of cotton, and later perfected for use with insects of sugar cane by Mr. T. E. Holloway, in charge sugar-cane investigations in the United States, has been used. It has been considered that a fair approximation of the conditions existing throughout a field will be obtained if four groups of twenty-five stalks each in various parts of the field are examined. If a considerable number of canefields are examined in one locality, it is considered that an average of the results obtained from such examinations will be a fair approximation of the conditions existing at that locality. Because *Diatraea* is by far the most generally important pest of cane, and its injury can be statistically recorded with comparative ease, much more data is available recording its abundance than of other cane insects. Mr. Holloway has records covering several years for many localities in Louisiana, Texas, and Florida, and the writer has made observations in many localities in Cuba and Jamaica last winter, and this year has quite thoroughly covered the cane-producing sections of Porto Rico, besides having made less extensive observations in Demerara, Trinidad, and Barbados two years ago.

It is from a consideration of the careful observations made in Porto Rico during the present grinding season, confirmed by those made in other countries, that a constant relation was first noted between the abundance of *Diatraea* and the amount of rainfall. Working along similar lines, Mr. Holloway has contended ("Louisiana Planter," 19th December, 1914) that the abundance of *Diatraea* depends in large part

upon the scarcity of the cosmopolitan and omnipresent egg parasite of the borer, *Trichogramma minutum.* Field experiments in Texas and Louisiana, carried on for two years by Mr. Holloway, have quite effectually demonstrated that the burning of the cane trash (tops and leaves) after the cane is harvested destroys large numbers of *Trichogramma,* as is evidenced by a larger number of cane stalks injured by *Diatraea* in the succeeding crop than in check fields where the trash is not burned.

It seemed very important to discover whether the effect of burning or not burning the trash was as important in Porto Rico as in Louisiana, and many observations were made in all parts of the island to determine this point. For the purpose of making a comparison, it would be necessary for a field where the trash had been burned and one where it had not been burned to be adjacent, and the treatment each received to be practically the same, aside from the difference regarding the treatment of the trash. Only one such instance was found—at Central Aguirre, Hacienda Aguirre, Tablón No. 10, a field of first-ratoon Crystalina cane beside the Ponce and Guayama Railroad, where the trash on about half the field had been accidentally burned by a fire started by sparks from a railroad engine, and on the other part of the field the trash had not been burned. In the unburned area only 22 per cent. of the cane was infested with *Diatraea,* but in the burned area 75 per cent. was infested. This was only one field, and it became increasingly apparent as more observations were made, that such conditions would seldom be found, as it is characteristic of the north coast not to burn the trash, and equally characteristic of the south coast to burn the trash. Although the fields on the south side of the island showed a much greater abundance of *Diatraea* than those on the north side, it was felt that so many other conditions were different that these in large part might be responsible for the marked difference.

For instance, at Central Los Caños, near Arecibo, Mr. Childs, the administrator, has been very careful not to burn trash except where necessary, yet the cane there is more heavily infested by *Diatraea* than at some other places where less care is exercised in preventing the accidental burning of the trash, but where rainfall is more abundant. The writer's recollection of the heavily-infested cane in Barbados, where trash is never burned, but because of deficient rainfall is carefully placed over the soil around the young cane to conserve all possible moisture, and where *Trichogramma* is present in considerable abundance, indicated that the non-burning of trash could not be the only control factor. At Central Constancia, near Cienfuegos, Cuba, the cane around the mill is almost entirely free from borer injury, but at Horquita, an *hacienda* of the mill 17 miles away, the cane is heavily infested. The only obvious difference is that at Horquita the rainfall is deficient and the cane is grown under irrigation. Although, in a general way, trash is not burned in Cuba, no particular care is exercised in preventing its accidental burning, and the control of *Diatraea* by *Trichogramma* can hardly be sufficient explanation of the comparatively slight amount of injury caused by the borer. In the cane-growing sections of Havana, Matanzas, and Santa Clara provinces, the annual rainfall averages from

over 50 in. to nearly 90 in.—or more than on the north side of Porto Rico—and the infestation by *Diatraea* averages about 10 per cent. In Camagüey and Oriente provinces the annual rainfall is from 30 in. to 50 in., and at Central Chaparra, where the annual rainfall is 33 in., the infestation by borer is 40 per cent. In Trinidad the rainfall is more than ample, and *Diatraea* is third in importance as a cane pest.

In Jamaica cane insects are not abundant, but there is a very noticeable difference in abundance on the north and south sides. On the south side, *Diatraea* infests 15 to 30 per cent. of the stalks, but on the north side only a careful search will disclose borer injury. Conditions as regards burning trash are identical, as practically all the cane is ratooned, or planted in, for many years, and trash is never burned. On the south side it is kept as a soil mulch, as rainfall is usually insufficient and irrigation is used whenever the water is available, but on the north side, beside being grown in fertile valleys, cane is planted on such steep hillsides that its growth would be impossible without abundant rains at all seasons.

The physical conformation and climatic conditions of Jamaica and Porto Rico are quite similar, and it is to be expected that a similar scarcity of *Diatraea* on the north side and relative abundance on the south side would be found. This is well illustrated for Porto Rico by the accompanying map, which shows the percentages of infestation of cane by *Diatraea* in conjunction with the total annual rainfall in inches

Total annual rainfall and average infestation of sugar-cane by *Diatraea saccharalis* at various localities in Porto Rico; also infestation in fields where trash was burned and where trash was not burned.

Locality.	Inches of Rainfall 1914.	Percentage of Infestation, 1914-15.		
		Average of all Fields.	Fields where Trash was Burned.	Fields where Trash was not Burned.
Coloso	101	6 (8)	..	6 (8)
Añasco	95	5 (6)	..	5 (6)
Fajardo	76*	11 (15)	13 (6)	9 (9)
Manatí-Morovis	72	6 (9)	10 (2)	4 (7)
Canóvanas	70	11 (4)	..	11 (4)
Toa Baja	70	15 (8)	19 (4)	10 (4)
Río Piedras	66	17 (7)	..	17 (7)
Vega Baja	66	39 (9)	44 (5)	26 (4)
Caguas	58	6 (5)	..	6 (5)
Yabucoa	58	37 (5)	60 (2)	22 (3)
Arecibo	55	26 (16)	69 (1)	23 (15)
Juana Díaz	60	32 (9)	34 (8)	18 (1)
Guayama-Josefa	45	47 (4)	47 (4)	..
Aguirre	34	45 (7)	50 (5)	31 (2)
Potala	27	37 (9)	44 (6)	24 (3)
Ponce	25	48 (8)	48 (8)	..
Destino-Salinas	23	64 (5)	77 (3)	44 (2)
Guayanilla	24	76 (5)	76 (5)	..
Santa Isabel	22	72 (4)	78 (3)	46 (1)
Guánica	21	66 (28)	68 (24)	31 (4)

NOTE.—Figures in ( ) after percentages indicate numbers of fields examined.

* Average of rainfall of *haciendas*; not of the town.

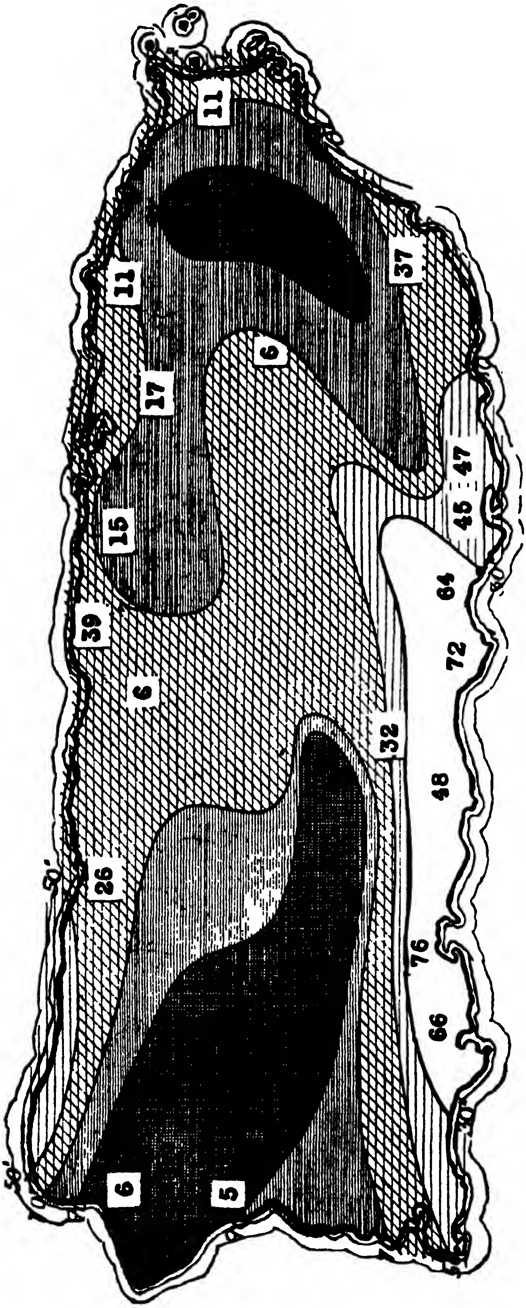
for 1914, and when such data are arranged in statistic form (table) they are shown to be most strikingly inversely proportional. One of the most striking things brought out by this data is the remarkable difference in infestation on the south coast when in an occasional field the trash is not burned, and on the north cost when the trash is burned. In most cases the difference amounts to nearly 100 per cent. higher infestation by borer in fields where the trash has been burned than in fields where it was not burned.

That rainfall affects the abundance of the smaller moth borer is of scientific interest, but apparently no economic application can be made of this fact. But it would seem to be quite possible for planters to take advantage of the relation which has been found to exist between trash burning and borer infestation, and stop burning trash.

If a heavy yielding field is to be replanted, it is usually so densely covered with trash that this must be burned before it can be ploughed. If the field is to be ratooned, however, the trash can be raked into alternate rows, at an expense generally averaging about 75 cents per acre, where it will not be in the way of the young shoots, and the other rows may be cultivated or have irrigation water run through them. If the cane is grown in banks, the trash can be raked up on top of the bank between the cane stools, where it will not clog the drainage ditches. On the hilly land and the heavy clay soils in Porto Rico, which include most of the best cane lands on the north side of the island, and on the swamp or *poyal* lands along the seacoast of all sides of the island, thorough preparation of the soil for replanting is difficult and expensive, and it is a common practice to ratoon cane as long as the yield is satisfactory. Thus, on what is by far the largest part of the land devoted to cane in Porto Rico, for the one and usually two or more years when the cane is ratooned the trash *need not* and *should not* be burned.

On the light, sandy, and easily worked soils of the south side of the island, cane is replanted each year and very seldom ratooned. These are usually fertile and valuable lands, often producing heavy tonnages of cane. The trash is abundant and almost invariably is burned each year, and as a result often *all* the stalks of cane in these fields are infested and sometimes badly injured by the borer. Because these lands are planted each year, Otaheite (Caña Blanca) is the favourite variety of cane, as it gives a good yield the first year, and, as it is not ratooned, its usual inability to give a good ratoon crop does not matter. Other cane varieties, such as D 117, B 3412, and B 3922, will usually give as good or better returns than Otaheite the first year and ratoon well the second year, thus effecting a saving of the cost of fitting and replanting, and requiring less water to start the ratoons than plant cane. The wider use of these or similar heavy yielding and good ratooning varieties can be unequivocally recommended, and if the trash is not burned for the first ratoon, this will have a very marked effect in reducing the amount of borer damage.

Percentage of Infestation by Sugar-Cane Moth Stalk-Borer (*Diatraea saccharalis.*)



Total Annual Rainfall. 1914.

SCALE OF SHADES—In Inches

Less than 30 | 30 to 50 | 50 to 70 | 70 to 90 | More than 90

Although conditions as regards insect injury are very bad on the south coast of Porto Rico, in large part due to the systematic burning of trash, it is probable that *Diatraea* will also each year become more abundant on the north coast at places where it has been customary to burn trash, unless this practice is discontinued. Conditions in Louisiana may be cited as an example. There, with an abundance of rainfall (53 in. at Melville as a minimum and 97 in. at Donaldsonville as a maximum in 1913) and a severe winter which the borer must survive, one would expect the injury by borer to be slight. For generations, however, the cane trash has been systematically burned, and the infestation by *Diatraea* in sections where cane is most extensively grown is very high, averaging 70 per cent. Although other factors may have helped to produce this condition, the fact that the heavy rainfall would tend to keep down infestation clearly indicates that to the burning of trash is due the great numbers of this pest. The remedy is obvious.

It is comparatively easy to demonstrate the effect of an abundance of rainfall in lessening the numbers of *Diatraea*, but much more difficult to satisfactorily account for this effect. Last winter, in Cuba, it was observed that considerable numbers of borer larvæ were killed in young cane by the more rapid growth of the central shoot of a cane plant than of the outer leaves. Also, larvæ were found which had been drowned in a mixture of water and decaying cane juices which had collected in their tunnels after rains. To avoid danger from these causes, many larvæ were found living outside the shoot, where they are exposed to the attacks of predators and parasites. Tachinid flies are important parasites of *Diatraea* larvæ in Cuba and possibly destroy 25 per cent. of the larvæ.

In older cane the borer larvæ spend practically all their existence within the stalk of the cane, and only occasionally do they crawl out. It may be considered that this stage of the insect is practically unaffected by rainfall. The eggs of *Diatraea* are deposited on the leaves of the cane, and when the young larvæ hatch, a considerable interval elapses while they crawl about on the cane before they enter the stalk, or the midrib of the leaf. It is quite probable that this is one of the most crucial periods in its life history, and that many newly-hatched larvæ fail to enter the cane before they are washed off by the rain. At this time, also, they would fall an easy prey to predators, especially *hormiga brava, Solenopsis geminata.* No theories have been advanced as to how rainfall may affect the adult moths, or the deposition of eggs.

SUMMARY.

The abundance of the smaller moth borer, *Diatraea saccharalis,* the most important pest of cane in the New World, depends upon two factors—rainfall and the burning of trash. Rainfall cannot be controlled, but in many cases in Porto Rico, trash is needlessly burned. Burning trash increases the abundance of the borer 100 per cent. DON'T BURN THE CANE TRASH.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

BY J. F. BAILEY AND C. T. WHITE.

No. 3.

KHAKI WEED.

ALTERNANTHERA ACHYRANTHA, R.Br.

During the past few years specimens of the South American plant (*Alternanthera achyrantha*) have been sent in from various parts of the State with reports as to its troublesome character.

This plant was introduced into South Africa with fodder from Argentina at the time of the last Boer war, and has since been declared a noxious weed in quite a number of districts in that country. From South Africa it found its way to New South Wales, and then to this State. It is known in South Africa and New South Wales as Khaki Weed, owing to its colour, according to J. H. Maiden, Government Botanist of New South Wales, and for the reason of its war association, according to N. S. Pillans, in the "Agricultural Journal" of the Cape of Good Hope, for September, 1910. In the latter it states that "opinions assert its noxious qualities owing to the spiny parts of the clusters of little flowers becoming entangled in sheep's wool. Since the plant grows prostrate on the ground, it is presumably when the animals lie down that the trouble occurs." In some quarters it has been suggested that the plant be declared a noxious weed in this State, and we are inclined to agree that it deserves a place on the list; for, although it belongs to a family which furnishes wholesome feed, its value in this direction is not commensurate with its troublesome character.

A year or two ago it was noticed to be very abundant on the footpaths near the Boonah Railway Station, and complaints have been made by schoolmasters in this and the Esk districts that the spines are very troublesome to the feet of the school children. Among other localities where the weed has made its appearance are Charters Towers, Springsure, Booyal, Bundanba, Brisbane and suburbs, and Rockhampton. Alderman Wilkinson, in writing about it from the latter place, in 1912, stated: "This burr creeper has made its appearance in this district. It is exceedingly aggressive, covering a large tract of ground rapidly, and giving nothing else a chance in its vicinity. It seems quite at home on the ordinary macadamised road." Mr. E .H. T. Plant, when sending specimens from Charters Towers, in 1913, stated: "This burr weed has lately made its appearance in this place. . . . It appears to spread rapidly, and may become a serious nuisance if left alone."

The plant is of prostrate habit, with numerous slender stems forming a mat-like mass. The leaves are usually broadly ovate with a small point. They are from ½ in. to 1½ in. long, with a corresponding

width up to 1 inch. Clusters of spiny flower-heads are in the axils of the leaves. The fruit is a small bladder containing a minute brownish seed.

Like many plants of similar growth, the only successful mode of eradication is to destroy the plants previous to the seeding stage. Where the plants are growing thickly together, this might be done by spraying with any of the weed-killing preparations obtainable at the seed shops.

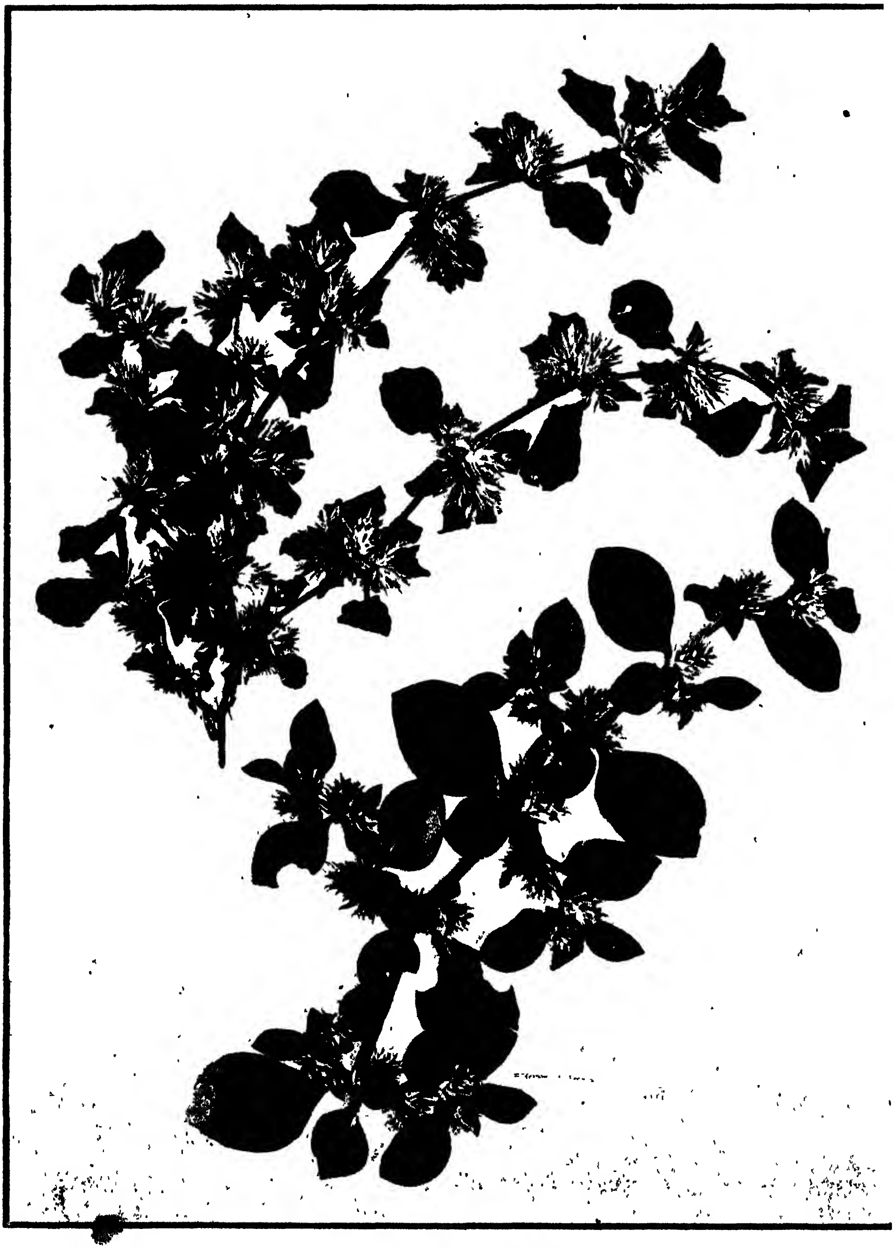


PLATE 17.—KHAKI WEED.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF MARCH, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Madam Melba	Holstein	28 Oct., 1915	945	4·4	48·93	
Lady Melba	,, ...	17 Dec. ,,	1,052	3·9	48·15	
Rosebud II.	Ayrshire	11 Oct. ,,	509	5·8	34·94	
Miss Bell ...	Jersey	2 July ,,	507	5·8	34·81	
Gretchen ...	Holstein	16 Aug. ,,	546	5·2	33·52	
Sweet Meadows	Jersey	28 Sept. ,,	462	6·1	33·38	
Miss Melba	Holstein	30 Sept. ,,	723	3·7	31·34	
Lady Margaret	Ayrshire	14 Oct. ,,	547	4·8	30·96	
Miss Lark ...	,, ...	8 Sept. ,,	441	5·8	30·26	
Bluebell ...	Jersey	20 June ,,	456	5·5	29·66	
Belinda ...	Ayrshire	27 Feb., 1916	567	4·4	29·36	
Lennie ...	,, ...	23 July, 1915	500	4·9	28·91	
Twylish's Maid	Jersey	22 Oct. ,,	404	5·8	27 73	
Burton's Lady	Shorthorn... ...	13 Jan., 1916	678	3·4	26·93	
Miss Edition	Jersey	27 Sept., 1915	411	5·5	26·73	
Violette's Peer's Girl	,, ...	8 Dec. ,,	477	4·7	26·41	
Jeannie ...	Ayrshire	1 Nov. ,,	469	4·5	24·85	
Dolly ..	Shorthorn... ...	23 Jan., 1916	473	4·4	24·49	
Bella ...	Ayrshire	25 Dec., 1915	496	4·2	24 47	
Daisy ...	Holstein	23 Nov. ,,	571	3·6	24 09	
Iron Plate ...	Jersey	20 Jan., 1916	408	5 0	24·07	
Lady Annette	Ayrshire	14 Nov., 1915	437	4·6	23·68	
Pauline ...	Shorthorn... ...	17 Sept. ,,	466	4·3	23·57	
Windyhill Davidina	Ayrshire	20 Aug. ,,	526	3·8	23·43	
Noble Dot ...	Jersey	2 May ,,	308	6·4	23 37	
Burton's Lily	Shorthorn	13 Jan., 1916	518	3·8	23·08	
Lady Lil ..	Jersey	27 June, 1915	346	5·6	22·91	
Lilia ...	Ayrshire	19 Aug. ,,	509	3·8	22·68	
Constancy ...	,, ...	24 Nov. ,,	473	4·0	22·21	
Glen ..	Shorthorn... ...	31 Oct. ,,	399	4·7	22·09	
Nellie II. ...	,, ...	20 July, 1914	431	4·3	21·80	
Special Edition	Jersey	1 Nov., 1915	360	5·1	21·68	
Miss Jean ...	Ayrshire	5 Nov. ,,	449	4·1	21·62	
Mischief ...	,, ...	27 Sept. ,,	504	3·6	21·32	
Lucinda ...	,, ...	14 Oct. ,,	477	3·8	21·24	
Lady Twylish	Jersey	5 June ,,	500	3·6	21·10	
Silver Nell ...	Shorthorn... ...	16 Aug. ,,	394	4·4	20·40	
Lady Dorset	Ayrshire	10 Aug. ,,	418	4·1	20·13	
Dottie ..	Shorthorn... ...	27 Nov. ,,	452	3·8	20·12	

The above cows were fed on natural pasture only.

Entomology.

COMBATING THE CANE BEETLE.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist to the Bureau:—

Research work relating to the control of the grub stage of our cane beetle is now in hand. A number of experiments in this connection were carried out last season, but being of a preliminary character were not made known.

The study of larvicides has been continued, as although this form of control is of secondary importance there are times when limited areas of grossly infested soil may be profitably treated with insecticidal solutions. The following chemicals were found to exhibit apparent larvicidal effects worthy of mention:—

1. Creolin (1 pint to 50 gallons water) applied to grubs in cages of soil at the laboratory proved fatal to 100 per cent. Its action was rapid, larvæ being partially decomposed twenty-four hours after treatment. The price, however, is prohibitive, as it would cost about a farthing to treat a single stool of cane with 2½ gallons of the above solution. Five quarts (1-50 formula) were applied to the roots of a stool at the laboratory without injuriously affecting the foliage.

2. Cyanide of potassium (1 lb. to 200 gallons water) destroyed 100 per cent. of larvæ in cages of soil, and also in the open when applied to the roots of a stool under which a dozen grubs had been placed and allowed to work for four hours before treatment. A cane plant 2 ft. high watered with 8 quarts of this solution showed slight signs of wilting of the foliage after twenty-four hours, but regained its normal appearance a week or so later.

The Mamelle method of applying cyanide by injection was tested in a preliminary way with satisfactory results. In one of these tests twenty grubs were placed a few inches apart in a trench about 4 in. deep around a flourishing stool of plant cane, and the earth replaced but not watered. On the following day two ½-oz. injections of a solution prepared by dissolving 7 oz. potassium cyanide in 1 quart of water were administered on each side of the stool, nearly under the centre of same. When examined five days later two living and thirteen dead grubs were found within a radius of 9 in. from centre of stool—the former embedded in hard subsoil below the level of injections—and four living specimens at a distance of 1 ft. from the plant. The injected solution was still decomposing, and diffused a strong odour of potassium cyanide. The above experiment was made last year, but fuller investigations were postponed in view of the high

price of this chemical. I may mention that the Mamelle process was first made known to our growers by Mr. Tryon in 1910 ("Australian Sugar Journal," volume II., page 88), who states:—"This treatment, allowing for about 50 cubic centimetres per plant, would work out at about 40 lb. of potassium cyanide per acre. And in estimating the cost a set-off must be made on account of the value as a fertiliser of the potash added to the soil through the procedure."

3. Borax (1 lb. to 3 gallons water) proved to be an efficient larvicide, but is too expensive for general purposes.

4. Creosote (8 oz. to 5 gallons water) emulsified with "Sunlight Soap" gave fair results. Control larvæ in each of the foregoing experiments remained normal throughout.

Solutions of the following chemicals applied to soil in cages had no perceptible effect on larvæ of the mealy-back cane-beetle:—Saltpetre (1 lb. to 3 gallons water), barium chloride (1 lb. to 3 gallons water), and hellebore (1 lb. to 12 gallons water). These negative results are somewhat remarkable, since both saltpetre and hellebore are known to possess decided larvicidal properties. Our stock of the latter chemical, however, was procured in Victoria more than a year ago, and may have deteriorated.

Experimentation regarding the control of the grub stage by means of stomach poisons was commenced about the 15th instant. Initial work in this connection during last season (not yet published) has served to direct present research into promising channels, and I may say that this branch of control is progressing favourably.

NEW FRUITGROWERS' ASSOCIATION.

At a large and enthusiastic meeting of fruitgrowers and intending fruitgrowers, held at the Town Hall, Gympie, on 9th March last, it was unanimously resolved to form a Gympie and District Fruitgrowers' Association, having for its objects—

To meet and exchange ideas and experiences; to arrange and attend to visits by Government Instructors; to deal with shipping and transport of fruit to markets; to improve present methods of sale and marketing; to combine in placing requirements and interests before Government departments; to affiliate with other similar associations for the general good of fruitgrowers. The fee for membership is only 5s. per annum. There is no doubt that this Association will be a great benefit to fruitgrowers and intending fruitgrowers in the extensive Gympie district, and it may be confidently relied upon that with the zeal and activity characteristic of the rural population of the district the Association will become a powerful factor in promoting the interests not only of their own district but also of other fruit-growing centres. The secretary is Mr. H. Sedgman, Mary street, Gympie.

Science.

THE PREVENTION AND TREATMENT OF BLACKWATER FEVER.

The "Rhodesian Agricultural Journal" some time ago published, for the benefit of farmers and settlers, a paper on the subject of Blackwater Fever, by A. M. Fleming, C.M.G., M.B., F.R.C.S. (Edin.), D.Ph. (Camb.), then Medical Director for Southern Rhodesia.

Seeing that in addition to the settled white population of Papua, there are also many Australian soldiers in different parts of New Guinea, and in the Bismarck Archipelago, in all of which islands there are vast, dense scrubs where the fever-carrying anophele mosquito breeds, and ordinary malaria and blackwater fever are of frequent occurrence, it may often happen that men are attacked by these ailments in localities where no medical man is available. As this Journal circulates in Papua and in other islands adjacent, we give the full text of Dr. Fleming's paper, in the hope that it may prove of service to our friends who are engaged in the arduous duty of guarding our recently acquired possessions there:—

"At the present stage of our knowledge, blackwater fever may be considered to be the result of malarial infection, which has been imperfectly treated. The vast majority of cases show a history of recurrent attacks of malaria, which have been made light of, the patient having possibly, whilst the symptoms were acute, taken a few doses of quinine, and then not bothered further.

"A great deal has been written, and more talked about, the dangers of taking quinine, and how it is supposed to bring on blackwater fever, and I would like, at the start, to disabuse the mind of the public on this point.

"The theory—for it still remains a theory—that quinine is responsible for the appearance of blackwater fever is by no means a new one, and, lately, has received the support of Professor Koch. The worst of it is that Professor Koch's arguments and conclusions have never been properly understood by the public, and I have often been told by the ignorant that, Professor Koch having proved that quinine caused blackwater fever, to take quinine for malaria was merely courting disaster.

"Now, I have had the pleasure of discussing this very point with Professor Koch himself, and can with certainty affirm that he never said anything of the sort. What Professor Koch did say was that in his opinion persons who were infected with malaria which had been imperfectly treated with quinine, became after a time predisposed to blackwater fever, and when in that condition a sudden dose of quinine was often the determining factor in bringing about an attack. He urged, therefore, that all persons infected with malaria should take full doses

of quinine, and continue the treatment for some time afterwards; in other words, so habituate themselves to quinine that they never reached the stage of chronic malaria, which predisposed to an attack of blackwater fever. A very different statement to the former, as you can see.

"It is still a disputed point whether quinine is or is not one of the causal factors in determining an outbreak of blackwater fever in persons predisposed to it from environment and previous malarial infection, and it is a question upon which much controversy still rages, and at the same time it would be quite out of place to discuss this here; it is sufficient to say that, if all cases of malaria were properly treated from the start with quinine regularly administered, and the administration continued in preventative doses for some weeks or months afterwards, blackwater fever would be a much rarer disease amongst us, if not eradicated altogether.

"In my experience of many thousands of cases of malaria, I have never seen blackwater fever occur in a person who was thoroughly cinchonised—that is, so far under the influence of quinine that his ears rung, and he was deaf from it. It is, however, not the cause of blackwater fever I want to write about so much as how to recognise it and treat it, when medical aid is not at once available.

"There is no difficulty in the recognition. It commences, as a rule, just as any ordinary attack of malaria, though the initial rigor (or shivering attack) is, as a rule, more severe and prolonged. Shortly afterwards the patient notices that on passing water, his urine looks jet black. If put in a glass vessel and held to the light, however, it is seen to be really a deep rich port wine colour. At the same time he becomes rapidly jaundiced all over, this being specially marked in the whites of the eyes.

"At the very first onset the patient should be put to bed, and the bowels opened with a sharp purge, preferably five grains of calomel. The diet should be entirely liquid, of a bland nature, warm milk and barley water being most suitable, if obtainable. The patient must be kept warm, and the greatest care taken to avoid chills and draughts.

"If vomiting is severe—and it often is, especially at the outset—the stomach can be washed out by giving large drinks of hot water with a few grains of bicarbonate of soda dissolved in each tumbler. Nourishment, in this case, should only be given in small quantities (few spoonfuls at a time) frequently repeated. Stimulants are, as a rule, unnecessary and undesirable, but if found necessary, probably the best is a little weak brandy and soda.

"As syncope or heart failure is not an infrequent complication, the patient must on no account leave his bed for any purpose whatsoever,

and must not even be allowed to sit up. If suppression—that is, stoppage of the flow of urine—threatens, warm applications such as linseed poultices, cloths wrung out of hot water, &c., should be applied to the back, in the region of the kidneys.

"As far as drug treatment is concerned, we have unfortunately no specific in blackwater fever, as quinine is in malarial fever. In British Central Africa, where blackwater is well known, good results are reported from a modification of what is known as 'Sternberg's Mixture for Yellow Fever.' This consists of thirty drops of liquor hydrargyri perchloridi and ten grains of bicarbonate of soda, taken in water every two hours for the first twenty-four hours, and subsequently every four hours till the urine clears.

"Others, again, have obtained good results from methyl arsenate of soda (arrhenal) in half-grain doses dissolved in sterilised water and injected hypodermically every six hours till the urine clears. As this, however, requires the requisite skill for the administration of the hypodermic injection, it can only be given by a medical man or trained nurse.

"The administration of quinine in large doses is advocated by some. This, however, should not be attempted, except where a doctor is in attendance and on his advice.

"Blackwater fever is a disease which will repay, more almost than any other, careful and intelligent nursing, and it is in this direction that the uninitiated can do most to alleviate the suffering of the patient and avert disaster, rather than by the administration of powerful drugs, concerning the action of which they know nothing, and the effects of which they cannot watch. The strictest attention must at all times be paid to the warmth of the patients, the diet, and the absence of all excitement or movement, and he or she should never be left long alone.

"After the attack and during convalescence, the anæmia and consequent debility is the most marked symptom, and the patient should not leave his bed till at least a fortnight has elapsed after the temperature has fallen and the urine completely cleared. During this time he should be fed upon milk, eggs, jellies, strong soups, &c. An iron tonic should at the same time be given.

"Persons who have once had blackwater fever are exceedingly prone to further attacks, if reinfected with malaria, so they should accustom themselves to taking quinine in preventative doses for a long time afterwards. Sir Patrick Manson has laid it down as a maxim that all those who have had blackwater fever should take five grains of quinine daily whilst living in a malarial district, and for at least six months after leaving it."

General Notes.

A NEW USE FOR SUNFLOWERS.

Amongst the various products of the sunflower, such as poultry food, oil, oil-cake, and fodder, there is one which appears to have only lately been discovered, and that is the value of the pith of the stalk.

The sunflower is cultivated to a considerable extent in Central Russia, where every part of the plant is put to certain economic uses. The discovery of the extreme lightness of the pith of the stalk has essentially increased the commercial value of the plant. This light, cellular substance is most carefully removed from the stalk and applied to a good many important uses. One of its chief uses is the making of life-saving appliances.

Cork with a buoyancy of one to five, and reindeer's hair with one to ten, have been used. The pith of the sunflower has a buoyancy of one to thirty-five. The latter can be used advantageously in the construction of boats and life-preservers. A sufficient quantity can be worn on a person without any inconvenience. The pith of the larger sunflower stalks is used extensively as a substitute for other materials formerly employed in making moxas for cauterising purposes.

PRICKLY-PEAR JELLY.

Rub off the spines very carefully with a thick cloth. Cut the fruit in half, and for every pound allow a pint of water. Boil till the fruit is almost in a pulp. Strain away the liquid, and for every pint allow the juice of a lemon and a pound of sugar. Simmer gently, removing any scum until the syrup jellies. Cover down with parchment paper, and store for future use. Jelly-making is more suitable for this fruit than jam-making, although the latter can be made by cutting the fruit in half, and then into small pieces, allowing pound for pound of sugar and fruit, with very little water in the bottom of the pan. The colour, like rosella jam or jelly, would be easily spoiled by too much water.

COPRA.

We have received from the Department of Agriculture, Fiji, a very interesting and instructive Bulletin giving the results of coconut experiments in Fiji, by C. H. Knowles, B.Sc. (Lond.), Superintendent of Agriculture. In experiments made with sample seed-nuts, kernels were dried in a room with an iron roof, and sides of copper gauze. For five days the kernels were not exposed to the sun at all, and during that time 37 per cent. of the kernels dried out. In five days more, excellent samples of copra were obtained from all the kernels, and no signs of mould were seen. Each lot of copra was carefully weighed, the percentages of copra in the kernel being from 58·8 to 61·3, the average being 59·9. Analysis of a sample taken from the copra made from one lot of kernels showed that the average content of oil was 60 per cent.

It is further remarked that with 3,854 nuts to make 1 ton of copra, or 193 to make 1 cwt., four nuts per tree per annum will give 1 cwt. of copra per acre with trees set 30 ft. by 30 ft. apart.

Answers to Correspondents.

TO MAKE ORANGE WINE.

NORTH COAST ORCHARDIST, Woombye—

The "Agricultural Gazette" of New South Wales, a few months ago gave the following in reply to a correspondent on the above subject:—

"HOW TO UTILISE THE SURPLUS ORANGE CROP.

"There are no certain data as to how many oranges are required to obtain 100 gallons of juice. It is evident that it depends on the size of fruit, thickness of the peel, on the variety, on the season, and on the pressure exercised in squeezing the fruit. The vessels and utensils required are—One vat in which to ferment the juice, about 150 gallons capacity; two casks of 100 gallons capacity each (one cask is filled with the orange wine, the other is a spare one, in which the wine is racked, so that it is exchanged from one vessel into another at certain periods); a few demijohns and jars; a small hand-press.

"To make 100 gallons of orange wine, an equal quantity of orange juice is obtained from as many fruit as required; to this 300 lb. of cane sugar are added; the whole is well stirred until the sugar is completely dissolved. The following ingredients are also added and well mixed, viz.:—

'Six oz. of ammonia phosphate (at 3s. per lb.); 1 oz. common salt; 1 lb. of cream of tartar (1s. per lb.); 10 lb. fresh wine lees, or 8 oz. beer yeast. Mix everything thoroughly in the juice; throw a sheet or a blanket over the vat, which should be placed in a cool room in a corner out of the reach of the sun. It is important that the juice be extracted from the fruit as rapidly as possible. The oranges are split in halves and quickly squeezed; a small press, all of wood—without iron fittings—would help very much, but care should be taken not to exercise a very strong pressure. Fermentation will gradually set in, and when this is completed and the juice is quite still, it is racked off and stored in one of the casks, leaving an ullage of 5 or 6 gallons, which are put in demijohns. An hydraulic bung is put in the bung-hole so as to allow of the escape of any residual carbonic acid. When the water in the hydraulic bung has ceased from bubbling, the ullage is filled and the cask bunged tight.

"The cost of making 100 gallons of orange wine will amount to about £10, including labour. Naturally, the outlay is not included in this estimate, and the outlay would be about £20 for the purchase of vat, casks, a small press, &c. A great saving might be effected by purchasing second-hand vessels. Good clean casks which have served to store wine, brandy, whisky, sherry, or port can be safely used. The orange wine so made is an intoxicant, and a person would not be authorised to sell it without first obtaining a license."

THE ALGAROBA BEAN.

E. KEELY, Kingsthorpe—

As we advised you by letter, the bean you have is the fruit of the Algaroba or Mezquit tree (*Prosopis juliflora*). Another kind is known also as Carob Locust and St. John's Bread (*Ceratonia siliqua*). The

PLATE 18.—THE ALGAROBA OR MEZQUIT BEAN.

dried pods are very sweet, and are largely sold by grocers on the continent, especially to school children. Herewith is an illustration of an Algaroba tree about 30 ft. high and five years old, growing at the Kamerunga State Nursery, Cairns, at the time the photograph was taken early in 1900. The beans make excellent fodder for stock.

GRAFTING THE GRAPE VINE.

"STANTHORPE"—

Mr. C. Ross, Instructor in Fruit Culture, to whom your questions were submitted, replies:—

Question 1.—Are grafted vines more vigorous and more profitable than rooted cuttings?

Answer. This depends on the vigour of the variety of stock and that of the parent of the scion. If the scion is from a weaker variety than the stock, extra vigour will be produced, and *vice versâ.* A shy-bearing variety if worked over a weaker variety of stock tends to produce more fruit and less wood.

Question 2.—To what plants do nurserymen refer when they mention Riparia or Rupestris?

Answer. These names refer to indigenous American vines and their many hybrids. The Riparia class is more suitable for moist situations and the Rupestris for dry and gravelly soils.

Question 3.—How can these plants be most easily raised as stocks for the foundation of a vineyard?

Answer. By cuttings.

Question 4.—Are there any other stocks suitable for grafting?

Answer. Besides those mentioned there is a very large number of varieties with their hybrids used as stocks for the prevention of Phylloxera. The following are a few, viz.:— Labusca, Æstivalis, Berlandion, Cordifolia, &c. The old Issabella and Lenoir also make good stocks. The Black Hamburg is a good stock upon which to work Muscat of Alexandria. The better setting of the fruit is facilitated, and there is more regularity in the size of the berries.

Question 5.—What is the best method of grafting upon the stock, and when should this be done?

Answer. The "Old English Cleft" or the "Whip Tongue" grafts. *See* article in last journal.

Question.—Lime and sulphur mixture preparations from Southern manufacturers?

Answer. Apply to Buzacott for ready-made lime and sulphur wash. *See* pamphlet for lime-sulphur formula. If made accordingly, no test is required.

ROSELLAS.

ROSELLA, Yeronga—

It is much too early to sow rosella seed. The proper time in the South is October. In the North, sowings may be made in November and December. When planting, the rows should be 5 or 6 ft. apart, and the plants in the rows 4 ft. The yield per plant is from 2½ to 4 lb. The number of plants per acre would be 1,742. Planted at distances 5 by 4 ft., the number would be 2,178.

A LEAKY TANK.

H., Woombye—

Wash off all dirt from the seams. Work into a putty one-fifth part of sulphate of iron, one-tenth of chloride of ammonia, and the balance lime or Portland cement. Apply this to the joints, and when it has set hard, paint inside and out with Portland cement and boiled linseed oil mixed together in such proportions as will produce a paint of the consistency of cream. Give a second coat of this in a day or two. It will take a little time to harden, and is elastic.

LIGHTNING METHOD OF TANNING SKINS.

RABBITER, Out West—

In the issue of this Journal for October, 1915, we gave the recipe for rapidly tanning skins. As you have probably not seen the Journal, we give you the recipe, which is:—

"The lightning or sulphuric acid process is the quickest method of tanning wallaby, rabbit, and other skins, and is a very simple one. Pour 5 or 6 quarts of boiling water over 2 quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to blood-warm water as much salt as will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add an ounce of sulphuric acid (H_2SO_4). Immerse the skins in the liquor, stirring them occasionally till tanned, which will be in about twenty minutes. When tanned, rinse in clean water, and hang out in shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft, and all flesh and grease should be well cleansed from them."

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1916.

Article.		APRIL. Prices.
Bacon	lb.	1s. 4½d.
Bran	ton	£5 10s.
Broom Millet	,,	£37
Butter	cwt.	130s. 8d.
Chaff, Mixed	ton	£6 15s.
Chaff, Oaten	,,	£5 5s. to £6
Chaff, Lucerne	,,	£6 to £9
Chaff, Wheaten	,,	£5
Cheese	lb.	9½d. to 9¾d.
Flour	ton	£12 5s.
Hams	lb.	1s. 1d.
Hay, Oaten (Victorian)	ton	...
Hay, Lucerne	,,	£6 to £7
Honey	lb.	4½d.
Maize	bush.	5s. 2d.
Oats	,,	3s. 9d.
Onions	ton	£6 10s. to £7 10s.
Peanuts	lb.	3d. to 3½d.
Pollard	ton	£6
Potatoes	,,	£9 10s. to £11 10s.
Potatoes (Sweet)	cwt.	5s. 3d. to 6s.
Pumpkins	ton	£3 10s. to £4 10s.
Eggs	doz.	1s. to 2s. 4d.
Fowls	pair	5s. 6d. to 8s.
Ducks, English	,,	4s.
Ducks, Muscovy	,,	5s. 6d to 7s. 6d.
Geese	,,	8s. to 8s. 6d.
Turkeys (Hens)	,,	11s. to 13s.
Turkeys (Gobblers)	,,	15s. to 18s.
Wheat	bush.	5s. 6d. to 6s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	2s. to 7s. 6d.
Beans, per sugar bag	2s. 6d. to 4s. 6d.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	9d. to 1s. 3d.
Chocos, per quarter-case	
Cucumbers, per dozen	6d to 9d.
Custard Marrows, per dozen	1s. to 1s. 9d.
Vegetable Marrows, per dozen	1s. to 1s. 9d.
Lettuce, per dozen	9d. to 1s.
Peas, per sugar bag	6s. to 9s.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	...
Sweet Potatoes, per cwt.	5s. 3d. to 6s.
Table Pumpkins, per dozen	2s. to 5s. 6d.
Tomatoes, per quarter-case	2s. to 3s.
Turnips, per dozen bunches	6d. to 1s.
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Queensland), per case ...	10s. to 12s.
Bananas (Fiji), per case ...	14s. to 15s.
Bananas (G.M.), per case ...	16s. to 17s.
Mandarins, per case	...
Mangoes, per case ...	...
Oranges (Navel), per case	..
Oranges (other), per case	...
Passion Fruit, per half-bushel case	5s. to 9s.
Lemons (Local), per bushel case ...	12s. to 18s.
Papaw Apples, per double-case ...	
Persimmons, per half-case	...
Pineapples (Queens), per double-case	9s. to 10s.
Pineapples (Ripleys), per double-case	5s. to 7s.
Pineapples (Common), per double-case	5s. to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Cucumbers, per case	..

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	APRIL. Prices.
Apples, American, per case	6s. to 7s.
Apples, Cooking, per quarter-case	6s. to 6s. 6d.
Apricots, per quarter-case...	
Bananas (Cavendish), per dozen ...	3d. to 6½d.
Bananas (Sugar), per dozen	3d. to 4½d.
Cherries, per case ...	...
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	4s. to 7s.
Granadillas ...	...
Lemons (Lisbon), per case	5s. to 10s.
Lemons (Italian), per case	25s. to 27s. 6d.
Limes, per quarter-case	...
Mandarins (Local), per half-case...	9s. to 11s.
Mangoes, per case ...	7s. to 9s.
Nectarines, per quarter-case	...
Oranges (American, Navel), per case	25s.
Oranges (other), per case ...	8s. to 10s.
Papaw Apples, per quarter-case ...	3s. 6d. to 4s.
Passion Fruit, per quarter-case ...	3s. to 6s. 6d.
Peaches, per case ...	9s. to 9s. 6d.
Pears, per half-bushel case	6s. 6d. to 10s.
Peanuts, per pound...	3d. to 3½d.
Persimmons, per quarter-case	3s. to 5s.
Plums, per half-bushel case	4s.
Pineapples (Ripleys), per dozen ...	5s. 6d. to 8s. 6d.
Pineapples (Rough), per dozen ...	2s. 6d to 5s. 6d.
Pineapples (Smooth), per dozen ...	1s. 9d. to 7s.
Quinces, per case ...	3s. 6d. to 6s.
Rockmelons, per dozen	...
Rosellas, per sugar bag	...
Strawberries, per dozen pint boxes	..
Tomatoes, per quarter-case	1s. to 2s. 6d.
Piemelons ...	...
Watermelons, per dozen ...	3s. to 6s.

TOP PRICES, ENOGGERA YARDS, MARCH, 1916.

Animal.	MARCH.
	Prices.
Bullocks	£16 10s. to £21 15s.
Bullocks (Single)	...
Cows	£10 10s to £15 7s. 6d.
Merino Wethers	37s. 6d.
Crossbred Wethers	38s.
Merino Ewes	26s. 6d.
Crossbred Ewes	36s. 6d.
Lambs	39s. 9d.
Pigs (Porkers)	81s.
Pigs (Slips)	...

LONDON QUOTATIONS.

London, April 8.

Large frozen rabbits are very firm. New South Wales blues, ex store, are quoted at 24s. 6d. per crate, but small are practically unsaleable, although offered at 15s.

The Liverpool quotation for middling American cotton, April-May shipment, is 7.47½d. per lb.; May-June, 7.81½d.

Jute: March-April shipment, from Calcutta, £33 15s. per ton.

Hemp: New Zealand, March-May shipment, £48 10s.; Mauritius, £37-£40.

Rubber: Fine, hard Pará, 3s. 0⅝d. per lb.; plantation, first latex crepe, 3s. 4½d.; smoked sheet, 3s. 4d.

Copra: South Sea, February-April shipment, £35 15s. per ton.

Raw linseed oil: Spot pipes, £38 10s. per ton.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1916.	Mar., 1915.
North Coast.	In.		In.	In.
Atherton	9·19	15	3 76	0·69
Cairns	19·25	34	5·74	4·74
Cardwell	16·98	44	6·34	0·99
Cooktown	15·39	40	16·11	2·58
Herberton	8·54	29	3·67	0·58
Ingham	16·69	24	13 81	3·87
Innisfail	26·58	35	15 33	3·44
Mossman	25·26	5	6 10	4·80
Townsville	8·36	45	7·06	0 02
Central Coast.				
Ayr	8·19	29	4·02	0·17
Bowen	6·27	45	0·58	0·09
Charters Towers ..	3·79	31	2·75	2·32
Mackay	12 88	45	4·64	2·37
Proserpine	13 90	13	3·77	1 35
St. Lawrence ...	6 43	45	1·87	Ni
South Coast.				
Biggenden	4·89	14	2 27	Nil
Bundaberg	5 73	33	3·26	0·07
Brisbane	6·02	65	1·38	0·11
Childers	5·61	21	2·19	0·15
Crohamhurst ...	13·44	22	3·06	0·25
Esk	5·16	29	3·27	0 48
Gayndah	3·37	45	1·40	Nil
Gympie	6·61	46	3·87	0 02
Glasshouse M'tains	11·69	6	2·00	0·10
Kilkivan	4·28	37	3·28	Nil
Maryborough ...	6·67	45	3 48	0 29
South Coast—continued:	In.		In.	In.
Nanango	3·46	34	2·14	0 12
Rockhampton ...	5·35	29	3·25	0·03
Woodford	8 87	29	2·08	0·06
Yandina	10 82	21	6 60	0·06
Darling Downs.				
Dalby	2·89	46	4·37	0·39
Emu Vale... ...	2·99	17	1·30	0·13
Jimbour	2·84	24	3·43	0·25
Miles	2 85	31	4·54	Nil
Stanthorpe ...	2·88	43	1·28	0·36
Toowoomba ...	4·07	44	2·35	0·27
Warwick	3·11	29	1·18	0·80
Maranoa.				
Roma	3 00	42	2·80	0·10
State Farms, &c.				
Gatton College ...	4·22	14	2·12	0·64
Gindie	3·06	13	1·34	0·07
Kamerunga Nurs'y	17·17	27	5·15	3·72
Kairi	...	.	..	0·75
Sugar Experiment Station, Mackay	13 53	16	3·48	3·97
Bungeworgorai ...	1·86	3	1·61	Nil
Warren	2·39	3	2·84	Nil
Hermitage ...	3·42	7	1·56	0·46

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March this year and for the same period of 1915, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE SECOND-FOUR MONTHS OF 1916.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6·15	5·14	6·32	5·0	6·40	5·4	6·29	5·19
4	6·15	5·13	6·32	5·0	6·40	5·4	6·29	5·20
5	6·16	5·13	6·33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5·0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6·27	5·21
8	6·18	5·11	6·34	4·59	6·40	5·6	6·26	5·21
9	6·18	5·10	6·35	4·59	6·39	5·6	6·25	5·22
10	6·19	5·10	6·35	4·59	6·39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·36	4·59	6·39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6·20	5·25
15	6·21	5·7	6·36	4·59	6·39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6·38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·10	6·17	5·27
19	6·24	5·5	6·38	5·0	6·37	5·11	6·16	5·27
20	6·24	5·5	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6·36	5·12	6·13	5·28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6·39	5·1	6·33	5·15	6·9	5·30
27	6·28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5.32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H. M.
2 May	●	New Moon	3 29 p.m.
10 „	☾	First Quarter	6 47 „
18 „	○	Full Moon	12 11 a.m.
24 „	☽	Last Quarter	3 16 p.m.

The moon will be farthest from the earth on the 7th, and nearest on the 19th.

1 June	●	New Moon	5 37 a.m.
9 „	☾	First Quarter	9 59 „
16 „	○	Full Moon	7 42 „
22 „	☽	Last Quarter	11 16 p.m.
30 „	●	New Moon	8 43 „

The moon will be farthest from the earth on the 4th, and nearest on the 16th at midnight.

8 July	☾	First Quarter	9 55 a.m.
15 „	○	Full Moon	2 40 „
22 „	☽	Last Quarter	9 33 „
30 „	●	New Moon	12 15 p.m.

The moon will be nearest to the earth on the 15th, and farthest from it on the 28th

7 Aug.	☾	First Quarter	5 6 a.m.
13 „	○	Full Moon	10 0 p.m.
21 „	☽	Last Quarter	10 52 „
29 „	●	New Moon	3 25 a.m.

The moon will be nearest to the earth on the 12th, and farthest from it on the 25th.

A partial eclipse of the moon will occur on 15th July at 2·30 p.m., when the moon will be below the horizon in Australia.

An eclipse of the sun will take place on 30th July. It will be partial only in Queensland but annular, or leaving the edge of the sun visible as a magnificent golden ring at Adelaide, and in a line across the south-west of Australia.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during May, June, July, and to the middle of August may be roughly arrived at by adding 20 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme mint &c. Eschalots, if ready, may be transplanted; also, horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist Spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the Summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly,

so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) as least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the Spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frost, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth, and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to overproduce fruit spurs, which become long and straggling, and bear a large quantity of small-size fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses or loose bark in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

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Agriculture.

RECRUITING IN GREAT BRITAIN.

(From the "Live Stock Journal," London.)

Labour on the State Farm.

Whatever may be the ultimate conclusion Parliament arrives at as to the future means of raising recruits for the Army, farmers and live stock breeders will find that a remarkably clear note has been struck upon the subject of their duty, and also that of their assistants, to the country by Lord Selborne in a statement he issued from the Board of Agriculture offices. The President of the Board has been so inundated with inquiries from agriculturists of all kinds as to the effect of Lord Derby's recruiting scheme that the statement he has prepared seeks to solve some of the problems that have arisen and are still likely to arise after the unsatisfactory debate in the Commons.

Certain classes of skilled agricultural workers have been starred in connection with the National Register. These will in no case be enlisted for immediate service with the colours, even if they offer themselves for that purpose; but they can, if they wish, be attested, passed

at once into Section B, Army Reserve, grouped, and returned to their civil occupations. A man accepted on these conditions will be entitled, as a soldier in the Reserve, to wear a khaki armlet, which will be given to him by the military authorities. Men will be grouped in the reserve in forty-six classes according to their age and condition, *i.e.*, married or single, and the groups will be called up for service in order. Starred men will not be called up for service unless the recruiting officer appeals to the local tribunal appointed by the District Council, on the ground that a particular man is improperly or unnecessarily starred. In such a case the local tribunal will investigate the case and report to the Central Appeal Committee, who will decide whether the man should be called up for service or not.

If any starred man has inadvertently been enlisted for immediate service with the colours, the employer at once should notify the Secretary of the County War Agricultural Committee and write to the War Office, who have undertaken to make every effort to return him to civil occupation.

In addition to the starred men, there are the cases of certain men who have not been starred owing to misdescription or other causes. If such a man offers himself for enlistment, the employer will have the right of appeal to the local tribunal, and, if it is decided that the man ought to have been starred, he will be placed in the same position as a starred man.

There are also certain men who, though they do not belong to the starred classes, are really indispensable on the farms or in the trades allied to agriculture. The man who manages a farm heads this list. If men who are really indispensable from the national point of view for the cultivation of the land feel impelled to offer themselves for military service, Lord Selborne strongly advises them not to enlist for immediate service, but to exercise their option of being attested and passed into the Reserve. This will ensure their present continuance in their civil occupation, and on each occasion that their group is called up an opportunity will be given through the local tribunals for consideration whether, on national grounds, their service should not be postponed to a later date.

We therefore feel certain that such an arrangement as the above should ensure that farmers, live stock breeders, and other agricultural employers shall keep their properly-starred men, and that in the doubtful cases they shall not be denuded of labour without being afforded an opportunity of having those cases considered; and, further, it will give them some necessary time to engage and train women or other substitutes.

Farmers themselves, in common with other employers, have not been starred, but it is essential that at least one member of the farmer's family should remain to direct the business. Lord Selborne considers that farmers of military age who desire to join the Army should not enlist for immediate service, but be attested and passed into the Reserve. He also feels sure, in view of the arrangements made for the retention of the skilled and indispensable men, that farmers and other agricultural employers will encourage the immediate enlistment of men who are not really indispensable.

With regard to the recruiting scheme of skilled farm workers, Lord Selborne desires it to be clearly understood that if a skilled agricultural

labourer, who has been "starred" as such, leaves his employment on the farm in order to take up other work not connected with agriculture, the "starring" of that man will cease to be operative, and he will be liable to be canvassed and enlisted for immediate service with the colours.

Lord Selborne's lucid statement should be kept well before farmers and live stock breeders. While city men and townspeople may, for the nonce, feel a legitimate indecision as to what the Government really does want, the countryman has had his position clearly defined for him. We can still hear these words which Lord Selborne rapped out into the ears of 200 leading agriculturists in that small committee-room of the House of Lords late in August last, when delegates from all the leading associations and unions met to hear his appeal. Said he on that occasion:—

"I hope those farms which have been nearly denuded will not be thoroughly denuded; at any rate, I have done, and I shall do, my best to take care that nowhere are what I call the most skilled class of agricultural labourers taken. What I shall aim at—and Lord Kitchener has been very sympathetic whenever I have conversed with him on the subject—is to leave you your foremen, your stockmen, carters, and shepherds. But if these are left you, in many cases the rest of the work, if done at all, will have to be done by women or by men who have not hitherto been engaged in agriculture."

And, again, he reiterated, when responding to a vote of thanks:—

"I say to the highest skilled men in agriculture—the foremen, stockmen, carters, shepherds, engine-drivers, thatchers, and blacksmiths —I say to them—if you leave your present post and go into the Army or Navy or into a munition factory, your motives may be good, but your judgment is wholly bad, and you can perform a greater service to England to-day by staying where you are than by going anywhere else."

Yet, in spite of these words, many farm hands have enthusiastically joined the colours. Fighting blood and the fighting spirit will out, whatever the walk of life. At the moment farm labour of any kind is difficult to secure, and skilled ploughmen—indispensable to the successful conduct of farming operations—are so scarce that farmers are asking that they should be starred, or, at least, put into a later division, so that their help will be available to the very last moment. The advice to plough up grass land, to grow a greater breadth of wheat, and to produce more food cannot be acted upon unless a sufficient number of helpers are left to accomplish the necessary work. So far, there has been no uniformity in recruiting. Some farmers have lost no responsible man, while others have given up their most valuable helpers. In many villages the young men have voluntarily enlisted *en masse*, but in others they are still waiting to be fetched. An even distribution of men skilled particularly in horse management is desirable, but the call of the Army is luring into its ranks all those high-spirited country boys who love the horse and the honest smell of stable hartshorn, and feel the stir of their blood in the work and evolutions of that branch of the Army which is, at the moment, appealing most mightily to the country-born boy—the Artillery.

A Scottish correspondent is prone to be dismal on the subject. He tells us that, with fewer men at a farm, it follows that a less number of

live stock will be kept. Already there are indications that many will leave fields of lea unploughed, he adds. Such steps might lead to serious results, apart from upsetting the rotations. Farmers are very willing to increase food production as far as possible, but the instrument for doing that—skilled labour—is being speedily thrust from them. Such views as these may not quite be merited, judged in the light of Lord Selborne's statement mentioned in our opening remarks. Yet the effect of recruiting on the agricultural labour market was brought sharply into view at the Martinmas hirings held during the week. Wages were higher all round. At Appleby there was a good supply of labour, considering the circumstances. At Carlisle "best men" received £25 to £30; men who can plough, £20 to £25; younger men, £17 to £20; lads, £12 to £15; dairy women, £14 to £16; young women, £9 to £11; and girls, £7 to £8. At Lancaster the situation was aggravated by the hesitation of farmers to engage men who may be requisitioned for military service. Men stood out for higher wages, and in order to get labour of any kind farmers were obliged to yield. Lads of seventeen years of age got as much as £20, and lads out for the first time from £8. There was also a great scarcity of women, especially good milkers. Experienced women received £14 10s. At Malton the effect was marked. Those present consisted mainly of young lads, and foremen, shepherds, and wagoners were hard to secure. Good foremen received £35 to £40 per year; hinds, 20s. to 22s. per week; beastmen, £24 to £28; shepherds, to £30; wagoners, to £27; and ploughmen, to £22.

All this, like everything else, hangs, of course, upon the future decisions of Parliament. As yet we have no clear course mapped out for us. Mr. Asquith, answering questions in the House of Commons, on Tuesday, as to recruiting and compulsion, expressed a confident belief that it would not be necessary to resort to coercive methods. Yet he did not know why married men were enlisting in the belief that they would not be called upon until all the young unmarried men had been called up. It was quite clear, he remarked, that there must be cases where it must be left to the discretion of the local tribunal, and with regard to which it might well be proved that unmarried men should not go. Compulsion could not be decided upon without the consent of Parliament. Out of all the maze of debate, charge and counter-charge of alleged conspiracy, as mentioned by Mr. Bonar Law the same night, the one outcome stands clear—that the country will do whatever is asked of it, and that no more loyal supporters to the Crown and to the Army exist than the farmers of Britain, their sons, and their hired hands.

DESTRUCTION OF TREES BY POISON.

Notwithstanding the numerous articles which have appeared in this Journal and the numerous letters we have written in reply to inquiries, giving clear instructions as to the method of killing trees and preventing the growth of suckers, by treatment with a solution of arsenic and soda, we yet receive many letters asking for information on the subject. "Garden and Field," Adelaide, has the same experience, and writes as follows in its issue of April, 1916:—

ARSENIC AND SODA METHOD.

Why Treatment Sometimes Fails.

A subscriber wrote to "The Farmer and Settler" averring that arsenic was no good for tree-killing, as the trees suckered and the work had to be done all over again. The reply he received was that he had probably gone about the work in exactly the right way, but at altogether the wrong time. This paper has written literally hundreds of letters to landholders covering instructions for tree-killing; but has never known one failure in which there was not a certainty or at least a strong presumption that the arsenic was used when the sap was active in the tree. There are other possible causes of failure, but farmers are too accustomed to following plain directions to be likely to err in any other particular than in the matter of season. And the reason they fail at this point is because it is not possible to indicate precisely when poisoning, to be successful, should be done.

The time for poisoning, as previously stated, is when the tree is dormant—that is, when the sap movement is at its minimum and the sap down in the roots and lower portions of the trunk. This occurs in the winter months from, say, March to July, according to the district. On parts of the North Coast, ringbarking has been carried out to the best advantage as late as June and early July in certain years, whereas in the more central parts of the State, late February and March have generally found the sap movement at its lowest.

The main object in catching the sap to season is to prevent suckering. Trees can be killed by poisoning or ringbarking at practically any time of the year, but to prevent suckering it is highly important to operate when the sap is down, or just completing its downward course.

An officer of the New South Wales Department of Agriculture has put into condensed form the experience of thousands of landholders, and he gives this advice as to how to set about poisoning timber as a quicker and cheaper method of destruction than ringbarking.

To Dissolve the Arsenic.

Ordinary arsenic is not very soluble in water, and soda—either in the form of washing soda or of caustic soda—has to be used to dissolve it. Ordinary washing soda requires to be used in the proportion of three of soda to one of arsenic, and boiling is necessary to bring about a complete solution. Caustic soda, which is much dearer, need only be used in the proportion of two of the soda to one of arsenic, and the heat generated, if a reasonable amount of water is added, is sufficient to obviate the necessity for boiling. For large quantities, washing soda is preferable, because the cheaper, but for small quantities caustic soda is perhaps better because it is handier.

The Mode of Operation.

In dissolving the arsenic, whether for washing or caustic soda solution, there is one point worth remembering: Do not tip the whole of the arsenic into the solution in a dry state, but mix it to a paste slowly and carefully, in the same way as the housewife treats her cornflour;

then pour it slowly into a solution of the soda, stirring it all the time, and being careful to stand away from the fumes, as they are poisonous. When once the soda and arsenic are dissolved and chemically combined, the balance of the water can be added to make up the required quantity.

A useful strength for quick and effective work in all kinds of timber is a solution prepared on this formula: Arsenic, 1 lb.; washing soda, 3 lb., or caustic soda, 2 lb.; water, 4 gallons; whiting, 1 lb. The whiting serves as an indicator on the trees treated, as it turns white on drying, making it quite certain what trees have been dealt with. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The tree that is to be operated upon is first rung with a "frill" ring. There is no doubt that "frilling" alone would kill timber if allowed time, but the poison does it in a fraction of the time—in fact, trees have been killed in a few days. The cuts must be through the bark and well into the wood proper, and they must be as close to the ground level as it is convenient to make them, consistent, of course, with the shape of tree; say, from 6 in. to 10 in. up.

For trees of 4 ft. diameter about a quart of solution is poured into this frilling, right around the tree. using an old teapot or kettle, as the spout makes pouring easy and less is wasted by spilling. Smaller trees, of course, need less solution.

Saplings may be cut off low down, and the solution may be dabbed on with a swab stick to kill and prevent suckering.

It is very important that this frilling and poisoning be consistently and thoroughly carried out, and not in any way scamped or slummed, if good results are to be looked for.

No fears need be entertained about stock being poisoned by eating the fallen or dead leaves from treated trees, and there is not much danger if they are even allowed to remain on the area; but to make sure it is desirable that all live stock should be excluded for three or four weeks.

The Question of Cost.

Estimates of cost are hardly likely to be of use, as there are several factors that vary with the district. A recent report of the manager of the new Condobolin Government demonstration farm records that poisoning was adopted there with success and economy. The work was done by day labour at a total cost of 1s. 5d. per acre. This must be considered very low, as the country was fairly heavily timbered, and the wages were from 1s. to 1s. 4½d. per hour. Said the manager: "The timber has all died, and mostly within forty-eight hours from the time of ringing."

The liquid was distributed by means of 1½-gal. watering cans with spouts made specially long, and having exit holes about the size of a No. 8 wire.

OIL SEEDS WHICH CAN BE PROFITABLY GROWN IN QUEENSLAND.

LINSEED.

Amongst the drying oils linseed stands pre-eminent, and except in one or two applications, no oil can be used in its place as a drying oil. Linseed is a product of the flax plant (*Linum usitatissimum*), and has a value over and above its oil content, as food for stock, &c. The largest

supplies of linseed come from Russia. In Europe the plant is grown chiefly for its fibre. In other countries, notably the United States of America, Argentine, Uruguay, and British India, which, with Russia, produce the bulk of the world's supply of linseed, the plant is grown almost exclusively for seed. In Argentine, the area under this crop in 1915-16 was 3,999,000 acres, producing 1,005,000 tons of seed; Canada, 803,000 acres, producing 265,000 tons; United States of America, 1,367,000 acres, which yielded 321,000 tons; India, 3,629,000 acres. Flax has been grown in Victoria for some years, and has proved a very payable crop. In Queensland the crop has only been tried experimentally, but from experiments made in 1910 at Biggenden State Farm by Mr. D. Macpherson, present manager of Kairi State Farm, it was proved that Queensland is eminently adapted to flax cultivation. Mr. Macpherson sowed a plot of three perches in April, and the crop was harvested in September. Owing to want of rain the seed did not germinate till the last week in May, so that the crop only took four months from germination to harvest. A portion was cut before the seed was ripe for fibre samples. From the remainder (exactly 64 square yards) 22 lb. of clean, plump seed and 47 lb. of threshed straw were obtained, or at the rate of 27 bushels (60 lb. per bushel) of seed, and 31 cwt. 3 qr. of straw to the acre.

The price of linseed is quoted in British trade journals at from 88s. to 93s. per 424 lb., or about 12s. 6d. to 13s. 3d. per bushel. Previous to the war the price was 8s. per bushel. The yield of flax seed in the United States of America varies from 8 to 15 bushels per acre; in other countries on an average 10 bushels. In the Biggenden experiment the yield of seed was 27 bushels of a present value of over £16. In addition, the fibre yield (from 6 to 8 cwt. per acre) has to be reckoned at, say, £2 per cwt., and 1 cwt. of tow at 10s. per cwt.

As an oil crop, linseed contains from 25 to 40 per cent. of oil, worth for raw oil 38s. 6d. per cwt., for refined 45s. per cwt. Finally, prime linseed oil cake, after the removal of the bulk of the oil, contains 10 per cent. Thus, out of 3 tons of whole linseed, 1 ton of oil is removed, and 2 tons of cake or meal are left for cattle food. The oil is quoted at 38s. 6d. per cwt. for raw and 45s. per cwt. for refined.

The Board of Agriculture thinks there is no reason why farmers in this country should not grow linseed, and thus avoid buying supplies at the present excessive price. At any rate, it is worth a trial.

OLIVE OIL.

The olive tree thrives in many parts of Queensland, both on the coast and on the high lands, and there are many old and young trees bearing good crops annually. Excellent olive oil used formerly to be made at the Penal Establishment, on the island of St. Helena, in Moreton Bay. Unfortunately of late the fruit fly (olive fly?) so damaged the ripe fruit that oil-making was discontinued. This oil readily sold in Brisbane at 12s. per gallon. In olive-growing countries the average yield of oil per tree on plantation is about 2 gallons, but individual trees will yield as much as from 12 to 20 gallons, while one renowned tree is stated to have yielded 55 gallons, and another 3 cwt. of oil. Taking the average to be as low as 1 gallon per tree, and sixty-three trees per acre, the produce at 10s. per gallon would be £30 per acre in the earlier years of bearing, exclusive of the value of the oil cake.

To-day olive oil is quoted at 59s. per cwt.

In a future article we shall deal with other oil seeds, such as cotton seed, soja bean, coconut, castor, &c.

Pastoral.

IN-BREEDING.

The writer of Poultry Notes in the Rockhampton "Morning Bulletin" has opened up a theory on in-breeding in the case of poultry and other stock, which, however contrary to the opinion generally held by breeders—that in-breeding is a cause of the deterioration of farm stock—is yet a theory which has received practical proof in many countries. He deals mainly with poultry, but his deductions apply equally to other animals, wild and domesticated, as for instance the bison of North America, the Chillingham cattle in England, the buffalo of Northern Australia, the reindeer, polar bear, the Australian dingo, and a host of other animals in all parts of the world—all instances of in-breeding without deterioration. We submitted the article here reproduced to Mr. Cuthbert Potts, Principal of the Queensland Agricultural College, who replied that the principles set out in it are quite correct, and he agrees with the writer up to a certain point. All good strains of the various breeds, in fact, the various breeds themselves, have been developed by close in- or line-breeding. It is the only legitimate procedure to adopt.

In-breeding, however, he remarks, doubles up weak characters as even as strong. On this account it is a dangerous method to adopt unless the breeder is a very keen judge and has a good knowledge of his subject. He (Mr. Potts) thinks this largely accounts for the fact that in-breeding is looked on with disfavour. The subject is a very large one, and might form the basis of a series of articles in the "Q.A. Journal."

Our correspondent, who forwarded us the "Morning Bulletin" containing the article, says: "If that doctrine is true, then, it is a pity it is not known all over the world and would save a lot of money to breeders of all sorts of stock. If it is not true, then, it is a pity that any paper widely distributed among farmers advocates it."

Mr. W. G. Brown, Instructor in Sheep and Wool, Queensland, gives us the following note on in-breeding which corroborates the doctrine enunciated in the article in question. He says: "There is no sheep stud of any value in the Commonwealth which does not use the line system of in-breeding. It is very many years, for instance, possibly fifty years, since an out-cross has been used in the Wanganella (Riverina) Merinos. It is certain that no fixed type in stock can be made without intelligent 'line' or in-breeding."

Following is the article on which our remarks are based:—

"How many breeders are there in the 'fancy' to-day who have not at some stage of their experience received definite instructions from customers when forwarding fowls to exercise care in supplying male and

female unrelated? The majority of novices issue these instructions, not because from their experience they have proved close relationship in poultry-breeding unsatisfactory in practice, but because it appears to be an accepted fact that no beneficial results can accrue from such a policy. This idea is as widespread as it is erroneous, and will take many years to overcome any appreciable extent. It has risen in most instances through want of knowledge, and has been to some extent encouraged by many experienced breeders, who, aware of the increased opposition they would have to encounter in competition were in-breeding more generally resorted to, advise the novice in every instance to secure unrelated blood when purchasing a breeding-pen, well knowing that this is the best system whereby to deprive him of the opportunity of achieving satisfactory results.

"So far as can be ascertained, the chief objection raised against in-breeding is that it destroys the fertility and stamina of the stock and results in deformed specimens being produced. That these serious defects are apparent in many instances can readily be endorsed, but that they are due solely to in-breeding is a matter of very grave doubt. Weedy specimens occur in numerous instances in which relationship between the parents is as distinct as the poles, comparatively speaking, so it can safely be attributed to other causes. On the other hand, some of the best show birds that have even been penned—perfect giants of their race—have been the result of a union between brother and sister for the third successive generation.

"As illustrating the extent to which consanguineous matings can be carried without injurious effects resulting, the case of the ordinary blue pigeon may be cited. A pair of these birds will in a few years found a flock of several thousands, all bred from the closest possible union; each pair, when able to provide for themselves, taking up their share of the duty of increasing the flock and continuing it for several generations on precisely similar lines. It can be asserted without the slightest fear of contradiction that the keenest scrutiny would fail to detect the slightest difference in size, health, and stamina between one of the original stock and one of, say, the tenth generation. Further illustrations, such as the various native birds, dingoes, rats, and rabbits, can be referred to as proving that in-breeding does not affect the stamina of progeny of closely related parents. Incestuous breeding amongst all the abovementioned is notorious, yet it would require a bold opponent of in-breeding to say that either of the two latter, at any rate, have forfeited any of their vigour, or have decreased in size in comparison with their progenitors of recent decades.

"A solution of the problem appears to be in the fact that many breeders, through careless methods rarely keep their birds in sufficiently good health to ensure vigorous offspring, yet they attach the whole of the blame to the birds by inferring that their want of success was entirely due to the fact of the birds being in-bred. In quite 90 per cent. of the cases wherein the growing stock shows signs of inherited constitutional weakness, it can safely be attributed to neglect on the owner's part by breeding from immature stock, from birds inheriting some serious

disease, or from specimens so overburdened with internal fat that their system has become impaired to such an extent that expecting healthy progeny from them was the height of folly.

"All the above are factors operating against successful results being obtained. no matter whether in-breeding has been resorted to or not, but from birds of a suitable age, and kept in good, clean healthy condition, sound, vigorous stock can always be relied on, even though the closest relationship has existed for unlimited generations. Expert breeders, especially those who rely on poultry-breeding for the whole or greater portion of their income, are fully seized of the fact that in-breeding must be practised to a very pronounced extent if anything approaching permanent success be aimed at. They accordingly, when laying the foundation of their strain, take steps to secure their stud birds from a reliable breeder and insist on having them closely related. The resultant progeny from such show a uniformity of quality that is really surprising and, by the selection of the best specimens to make back to the parents—that is, the pullets to their sire and a cockerel to his mother—the ensuing result is highly satisfactory. In-breeding thus is only advocated, however, when some special quality is desired, and at least one of the birds bear evidence of possessing it. It would be obviously unwise to mate two birds that were closely related, each possessing a decided fault, and expect them to produce perfect stock. It follows, as a matter of course, that every point or feature is strongly impressed by each successive generation. Hence imperfections are intensified equally with desirable qualities where line breeding is adopted, provided the stock have a tendency in that direction. It is advisable, therefore, for the breeder at all times to make himself thoroughly acquainted with the standard requirements of the varieties he fancies, and, when such instruction is thoroughly mastered, its adoption should be aimed at by the most careful selection and making up of stock showing the nearest approach to perfection in the greatest average of points. If sound judgment be brought to bear upon the matter, it will prove a comparatively easy task, for, by judicious in-breeding many points can be fixed in a remarkably short space of time, and a strain can thus readily be brought to within measurable reach of perfection.

"Convincing proof of the advantages of in-breeding lies in the fact that many of the most successful fighting game breeders in England have bred and fought their strains of birds for over twenty years without the introduction of fresh blood into their flock. When this can be accomplished successfully with a breed requiring the strength and courage necessary for pit fighting, it will be readily conceded that nothing but beneficial effects would result from similar lines applied to utility stock.

"It will be unhesitatingly acknowledged by every experienced breeder that a variety of fowl possessing distinctive characteristics can be relied on when bred in line for several years to impress the same qualities on their progeny in a very decided manner. Therefore, it can be most emphatically asserted that in-breeding introduced for any definite object,

such as egg production, table properties, or special show points, can be depended upon to achieve most satisfactory results, for not only the energy of the parent stock, but also that of the grandparents and still more remote ancestors, is concentrated in one direction, and thus speedily achieves by prepotency a result that would take years to obtain where fresh blood is continually introduced.

"The majority of amateurs, when embarking in the venture of pure-bred poultry-keeping, generally secure a setting of eggs with which to make a beginning. Such is an excellent plan, and can be strongly recommended when a reliable breeder is selected from which to obtain same. When these chicks are hatched, being more prized than ordinary stock, they receive extra attention and more liberal feeding, generally on unsuitable and highly stimulating foods that play havoc with their digestive organs and render them wholly unfit to undertake the task of propagation of their species. It is the mating of such birds together with the consequent disastrous results obtained from them that has given rise to the cry that in-breeding is injurious; but surely any unbiassed individual must know that birds pampered to an unusual extent must always prove unsatisfactory, no matter whether bred from closely related stock or otherwise? As before stated, lack of vitality is the root of the failures extending over the breeding season.

In-breeding, therefore, cannot be carried too far, provided always that due attention be paid to the general health and vigour of the stud birds. It is on this point that nature teaches us a most valuable lesson, for, with in-breeding as with other details, she vigorously insists on that admirable law being strictly observed—namely, the survival of the fittest."

FARMERS' SHEEP IN THE BURNETT.

By "BRINY."

I have read with much interest the review by Mr. W. C. Brown of the article on the above subject appearing in the April number of your journal.

This review, coming from such a source, must be accepted as from an authority, but there is a matter in it on which Mr. Brown does not throw sufficient light, and on which the evidence appears to be so strong that I would like, as briefly as possibly, to carry my case a little further.

The whole foundation of my standing is, and it seems to me important that the point should be generally recognised, that robust conditioned sheep do not first become infested with worms, and then, with worms as a first cause, fall away in condition and die, but that they must first be reduced in condition, and their constitutions weakened by such causes as rank or unsuitable feed, when, other conditions being favourable to worms, they are then unable to naturally resist the ravages of the worms. I wrote, "for whom, we are told, it is natural in limited numbers, that they should be the hosts." I had for this last statement, which I quoted from memory, an authority whose name I am unable to

call to mind; but I find that Dodd says: "A few worms may probably be found in most sheep." It surely then follows that sheep are able to pick up a few worms on most pastures. Therefore, sheep, as Mr. Brown says, "carrying worms in limited numbers would soon, given moisture and warmth, be infested with unlimited numbers"; but this is not always the case, as in his example of six sheep per acre on Rhodes grass on the moist, warm coastal areas.

There is another example in the Dallarnil Scrub, where some sheep have been kept successfully for years on paspalum. They were bought on worm-infested country, and they were worm-infested when put on the paspalum (the writer sold them), yet they did very well, even when broken mouthed; and I am told that, except during one wet summer, when the grass was rank and of a hothouse growth, they were not troubled with worms.

Mr. Brown writes: "As soon as the sheep can keep himself and the worms with which he is infested with a full supply of blood, he immediately begins to improve in condition. As he keeps on assimilating good fodder, he makes more and more blood, and reaches a good condition of health. He is keeping the worms in blood, and is also keeping himself in condition, because he is getting such good food that he has a surplus of blood for the use of his own economy." Now, if I may extend this statement to its natural limit, such a sheep, having reached a good condition of health, would acquire also a good condition of body and would also, at the same time, be highly infested with worms. Now, in actual fact, if a fat sheep or a fair conditioned sheep is killed from a worm-infested flock that has been some time on wormy country, it will not be found to be worm-infested to any material degree. A few worms may be found, but very few.

I have for several years in the past killed mutton from the best conditioned sheep of a worm-infested flock, and have always opened the stomach. Sometimes a few worms would be found, sometimes none, but never very many. Dry ewes have been killed, while at the same time the ewes of the same flock rearing lambs in the same paddock have been very highly worm-infested.

The condition of sheep among a worm-infested flock, feeding in the same paddock, varies according to the constitution of the individual sheep, not according to the quantity of worms picked up, for they are all subject to the same worm conditions, and the worm contents of the stomach will be found to vary in much the same proportion.

The bulk of the feed on such country is rank cattle feed, and unsuitable to sheep. Both classes of stock are subject to the same stomach worm, and surely the worm is picked up by both in the same proportion. But if the grass is eaten down by cattle they thrive and put on condition on such country. If sheep are compelled to eat it down they do not thrive, and the worms which they in common with the cattle pick up infest them.

If these grasses are first so fed down by cattle that only the sheep feed growing underneath is left, then if the country is lightly stocked with sheep they do thrive and resist the worms.

As was previously written, a well-nourished calf, reared on its mother, does not suffer with worms, yet how many poorly-nourished poddie calves die of worms yearly? The same remark applies to the fat lamb on its mother, while at the same time a weaner lamb in the same paddock may have its stomach as full of worms as a drain-pipe may be of roots.

In a somewhat similar way, a normal sheep will not carry cattle ticks, yet a poverty-stricken sheep will, on its bare parts, carry ticks to maturity.

And now, in conclusion, I may say that as to the mind of a person searching for the correct definition of a subject or a word there is more benefit to be derived from the reasoning and the searching than there is from the resulting definition. So also, if in my searching and reasoning I have expressed views resulting in variance with one who is able to express an expert opinion, I hope then that others, if they cannot agree with my results, may, at all events, with me obtain some benefit from the argument and reasoning preceding, and possibly be encouraged to try a few sheep on the forest farms of the Burnett. With this one object, after thanking Mr. Brown for his courteous criticism, I must leave the subject.

SHRINKAGE OF AUSTRALIAN WOOLS.

The U.S. Bureau of Standards have recently scoured several samples of Australian wool to determine the shrinkage.

Entire fleeces were not tested, but large handfuls of wool were selected from ten different parts of each fleece. The samples thus obtained were drawn from parts well distributed over the whole fleece (not including the skirts) and therefore gave the average. The one-half of each handful was placed together as one sample and is designated as "A" and the remaining portion of the sample marked "B."

The forty-nine fleeces herein described were carefully sampled and thoroughly cleansed of all grease and dirt, the results showing shrinkages from 19·5 to 54 per cent., according to the breed of sheep.

In the South Australian wools the greatest shrinkage difference between two determinations upon samples drawn in the same manner from the same fleece was 3 per cent., while for the New Zealand wools the largest difference was 6 per cent. These differences were calculated on the basis of raw-wool weight. This percentage variation within individual fleeces seems large, especially when the sampling was performed as described in the beginning of the article. If a sample had been drawn from one part of the fleeces and another had been drawn from an entirely different place, greater percentage variations would undoubtedly have occurred.

The difference in shrinkage between two fleeces of the same breed of sheep grown in the same location was found to be as great as 9·5 per cent. The results of such tests upon thirteen different breeds of sheep showed a mean variation of 4·5 per cent. in the shrinkage.—"National Wool Grower."

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF APRIL, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Melba	Holstein	28 Oct., 1915	762	3·8	33·94	
Cocoatina ...	Jersey	17 Mar., 1916	563	4·7	31·19	
Lady Margaret	Ayrshire	14 Oct., 1915	523	4·7	29·49	
Madam Melba	Holstein	17 Dec. ,,	556	4·4	28·79	
Lady Loch II.	Ayrshire	17 Mar., 1916	601	4·0	28·22	
Gretchen ...	Holstein	16 Aug., 1915	475	5·0	28·02	
Belinda ...	Ayrshire	27 Feb., 1916	549	4·3	27·77	
Miss Bell ...	Jersey	2 July, 1915	434	5·4	27·70	
La Hurette Hope	,, ...	17 Nov., ,,	464	5·0	27·37	
Twylish's Maid	,, ...	22 Oct. ,,	384	5·8	26·36	
Auntie's Lass	Ayrshire	4 April, 1916	591	3·8	26·32	
Miss Jean ...	,, ...	5 Nov., 1915	587	3·8	26·08	
Lady Twylish	Jersey	5 June ,,	375	5·8	25·74	
Violette's Peer's Girl	,, ...	8 Dec. ,,	425	5·0	25·07	
Jeannie ...	Ayrshire	1 Nov. ,,	462	4·6	24·95	
Miss Melba	Holstein	30 Sept. ,,	581	3·7	24.18	
Bluebell ...	Jersey	20 June ,,	371	5·5	24·12	
Sweet Meadows	,, ...	28 Sept. ,,	317	6·3	23·66	
Miss Edition	,, ...	27 Sept. ,,	355	5·6	23·50	
Noble Dot ...	,, ...	2 May ,,	330	6·0	23·45	
Iron Plate ...	,, ...	20 Jan., 1916	382	5·1	22·94	
Rosebud II.	Ayrshire	11 Oct., 1915	339	5·7	22·86	
Bella ...	,, ...	25 Dec. ,,	450	4·2	22·20	
Miss Lark ...	,, ...	8 Sept. ,,	347	5·3	21·72	
Burton's Lily	Shorthorn	13 Jan., 1916	472	3·8	21·01	
Silver Nell ...	,, ...	16 Aug. 1915	369	4·8	20·89	
Rosine ...	Ayrshire	7 Aug. ,,	408	4·3	20·64	
Burton's Lady	Shorthorn... ...	13 Jan., 1916	518	3·4	20·58	
Special Edition	Jersey	1 Nov., 1915	368	5·4	20·49	
Lady Annette	Ayrshire	14 Nov. ,,	375	4·6	20·32	
Simple Interest	Jersey	22 Oct. ,,	362	4·7	20·05	

The above cows were fed on natural pasture only.

THE NUBIAN MILCH GOAT.

Since the publication of our articles on the milch goat and its management last year, we have received many letters asking for information on the subject.

Mr. W. C. Carmody, Inspector of Stock, Department of Agriculture and Stock, who has practical experience in the management of the goat as a domestic milk supplier, has on several occasions communicated with the Veterinary Department of the Ministry of Agriculture in

Egypt, and the Department of Agriculture and Forests of the Sudan Government, with a view to getting information on the treatment of goats in Africa, their value as domestic animals, the yield of milk, feeding, breeding, price of goats, export, &c. He has received very courteous replies from the heads of the above departments, which we summarise for the information of our correspondents.

It will be noted that the value of goats between 11th November, 1915, and 28th February, 1916, has been considerably enhanced, doubtless owing to causes arising out of the war.

On the first-mentioned date, Mr. W. A. Davie, of the Sub-department of Agriculture at Khartoum, Sudan, in reply to Mr. Carmody, courteously supplied the following information concerning the Nubian goat:—

The average yield of milk daily is from 3 to 4 rotls (1 lb. = 1·009 rotl) and the goat would give this quantity for 120 days, or 1½ to 2 rotls for 60 days. The average height of the animals is 80 cms. (32 inches about) and the average weight 90 rotls (nearly 90 lb.).

The price per head would be—for males, 45 pt. (9s.); females, 60 pt. (12s.). Port Sudan would be the nearest place for shipment. Landed there, the prices for males and females would be about 12s. and 15s. respectively.

The milk is rich in butter fat, the percentage on an average being 4·5. The males have no disagreeable odour at any time. They are of all colours, but generally black and tan. They have small curved horns and are very docile.

Mr. Davie said that goats from Upper Egypt are larger and better bred than those of the Nubian Sudan, and suggested communicating with the Ministry for Agriculture, Cairo. This Mr. Carmody did, and received a full reply, dated Cairo, 28th February, 1916, from the Director, Veterinary Service, to the following effect:—

Good goats give 2 litres (about 3⅗ pints) daily when in full milk, and from 200 to 300 litres (180 to 270 quarts) for a milking period of six to eight months. A selected goat might reach 3 litres per day when in full milk and give a total of 350 litres.

The average height of these goats is about 32-33 inches for males, and 28-29 inches for females.

Goats could be shipped at Suez, though probably Port Said would be more convenient.

Price for males, £3 to £5; females, £3 to £6.

It may be added that Mr. Davie says the chief characteristic of the Nubian goat is the ability to pick up a living in the most unpromising and most unlikely places.

The freight to the port of shipment would be only a few shillings.

Prohibition as to export from Egypt and import into Queensland: Provided that the permission of the Minister shall be obtained prior to the departure of any domesticated animal from the port of shipment to Australia, such animals may be imported into Australia, presumably if covered by a certificate by a member of the Royal College of Veterinary Surgeons.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1916.

The new competition commenced on 1st April with 73 pens, 20 of which are in single hen tests, making a total of 438 competing birds. These include 55 pens of White Leghorns, 10 of Black Orpingtons, 4 of Rhode Island Reds, and one each of Red Sussex, White Wyandottes, Silver Laced Wyandottes, and Sicilian Buttercups. Some of the birds were too old when sent, and had been laying for some time; in nearly every case these have gone into moult. The pens owned by the following are in moult:—Messrs. Manson (White Leghorns), Gill, West, Pettit, Purvis, Coates, Becker, Dennis (White Wyandottes), Moritz Brothers, Lindus, Hammill, Leney (Rhode Island Reds), Knowles, Richter, Pocock, and Smith. The pens of the following owners have had a slight attack of chicken pox:—Burns (Black Orpingtons), Cowan Brothers (2 pens), Mars, P. F. (White Leghorns), and Mrs. Bradburne. A few of the other pens are off their food and may go into moult at any time. Many of the birds that were laying on arrival here have completely stopped for the above reasons, so that the average for the month is very low. Mr. T. Fanning wins the monthly prize with 104 eggs. The following are the individual records:—

Competitors.	Breed.	April.
*T. Fanning, Ashgrove, Brisbane	White Leghorns ...	104
*J. Anderson, Mordialloc, Victoria ...	Red Sussex	86
T. B. Hawkins, Redbank	White Leghorns ...	77
Mrs. Bradburne, Kogarah, N.S.W. ...	Do. ...	75
S. B. Tutin, Kalkie, Bundaberg	Do.	66
A. H. Padman, Adelaide, S.A.	Do. ...	65
A. Howe, Wickham, Newcastle, N.S.W. ...	Do.	64
*Mrs. J. Jobling, Plattsburg, N.S.W.	Black Orpingtons	64
*A. T. Coomber, Brown's Estate, Bundaberg ...	White Leghorns .	64
T. E. Jarman, Eastwood, N.S.W.	Do. .	62
P. Brodie, Glengyle, Greenmount	Do.	62
*J. Zahl, Boonah	Do. .	61
*A. E. Walters, Bank street, South Brisbane ..	Do.	56
*Dixie Egg Plant, Newmarket	Do. .	55
T. Taylor, Thompson Estate, South Brisbane	Do. ...	55
H. Jobling, Cessnock, N.S.W.	Black Orpingtons	54
G. H. Turner, Aratula	White Leghorns .	53
*Kelvin Poultry Farm, Kelvin Grove, Brisbane	Do. ..	51

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	April.
W. Lyell, Graceville	White Leghorns ...	49
*E. A. Smith, Paddington, Brisbane	Do.	48
C. W. Holland, Paddington, Brisbane	Do.	48
H. W. Broad, Corinda	Do.	45
*J. H. Gill, Cheltenham, Victoria	Do.	45
Mrs Munro, Sunnyside, Warwick	Do.	44
*J. H. Madrers, Kogarah, N.S.W.	Rhode Island Reds ...	44
E. Pocock, Windsor	White Leghorns ...	42
C. P. Buchanan, Brisbane	Do.	42
*C. Knoblauch, South Brisbane	Do.	41
King and Watson, St. Mary's, N.S.W.	Do.	40
J. M. Manson, Milton	Black Orpingtons ..	39
*E. F. Dennis, Brisbane	White Leghorns ...	38
*W. L. Forrest, Marrickville, N.S.W.	Do.	38
Geo. Tomlinson, Boonah	Do.	36
J. Anderson, Mordialloc, Victoria	Do.	34
W. Lindus, Cessnock, N.S.W.	Do.	34
A. W. Bailey, Red Hill, Brisbane	Do.	33
F. Clayton, Blacktown, N.S.W.	Rhode Island Reds ...	30
Mrs. C. Davis, Engelsburg	White Leghorns ..	30
W. Menceely, Warwick	Do.	30
Kelvin Poultry Farm, Kelvin Grove, Brisbane ...	Do.	30
W. Hirst, Blacktown, N.S.W.	Do.	30
Dr. E C. Jennings, Ipswich	Do.	29
*J. M. Manson, Milton	Do.	28
W. H. Forsyth, Willoughby, N.S.W.	Black Orpingtons ...	28
F. Clayton, Blacktown, N.S.W.	White Leghorns ...	27
*W. H. Knowles, junr., Taringa	Do.	26
H. Hammill, Kogarah, N.S.W.	Do.	25
*E. West, Grove Estate, Brisbane	Do.	25
*Loloma Poultry Farm, Rockdale, N.S.W. ...	Rhode Island Reds ...	24
E. W. Leney, Warwick	White Leghorns ..	23
J. Gosley, Childers	Do.	22
W. Becker, Toowoomba	Do.	22
A. T. Coomber, Bundaberg	Sicilian Buttercups ..	20
Mars Poultry Farm, Sunnybank	White Leghorns ..	20
F. W. Leney, Warwick	Rhode Island Reds ..	19
Cowan Bros., Burwood, N.S.W.	Black Orpingtons ...	19
*Miss May Hinze, Milton	White Leghorns ..	19
Harveston Poultry Farm, Rockhampton ...	Do.	18
A. F. Camkin, Canley Vale, N.S.W.	Do.	16
Geo. Prince, Grove Estate, Brisbane	Do.	14
T. Fanning, Ashgrove, Brisbane	Black Orpingtons ..	13
L. K. Pettit, Eastwood, N.S.W.	White Leghorns ...	11
R. Burns, Sladevale, Warwick	Black Orpingtons ...	10
J. G. Richter, Aratula	White Leghorns ..	6
W. Purvis, Glanville Blocks, S.A.	Do.	6
Moritz Bros., Kalangadoo, S.A.	Do.	5
R. Burns, Sladevale, Warwick	S. L. Wyandottes ...	3
J. R. Wilson, Eudlo	White Leghorns ..	3
Mars Poultry Farm, Sunnybank	Black Orpingtons ..	3
E. F. Dennis, Brisbane	White Wyandottes ..	0
E. F. Dennis, Brisbane	Black Orpingtons .	0
Cowan Bros., Burwood, N.S.W.	White Leghorns ..	0
*J. W. Macrae, Mareeba	Black Orpingtons ..	0
Total	...	2,548

Pens marked * are engaged in single hen test.

RETURNS FROM SINGLE HEN TESTS.

Competitors.	Breed.	A.	B.	C.	D.	E.	F.	Total.
T. Fanning	White Leghorns ...	23	22	20	13	18	8	104
J. Anderson	Red Sussex	24	10	18	0	22	12	86
Mrs. J. Jobling ...	Black Orpingtons ...	22	23	0	14	2	3	64
A. T. Coomber	White Leghorns ...	14	16	6	11	4	13	64
J. Zahl	Do.	14	9	14	11	7	6	61
A. E. Walters	Do.	8	20	5	1	16	6	56
Dixie Egg Plant ...	Do.	19	18	5	0	0	13	55
Kelvin Poultry Farm ...	Do.	6	6	18	0	16	5	51
E. A. Smith	Do.	7	0	4	17	5	15	48
J. H. Gill	Do.	3	17	5	17	1	2	45
J. H. Madrers	Rhode Island Reds ...	0	1	15	19	8	1	44
C. Knoblauch	White Leghorns ...	9	2	6	6	5	13	41
E. F. Dennis	Do.	1	10	4	14	5	4	38
W. L. Forrest	Do.	2	9	10	11	6	0	38
J. M. Manson	Do.	0	21	5	0	2	0	28
W. H. Knowles, junr....	Do.	15	7	3	1	0	0	26
E. West...	Do.	4	5	0	0	0	16	25
Loloma Poultry Farm...	Rhode Island Reds ...	9	0	14	0	0	1	24
Miss May Hinze ...	White Leghorns ...	1	0	14	4	0	0	19
J. Macrae	Black Orpingtons ...	0	0	0	0	0	0	0

FINAL REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, 1915-16.

The twelfth egg-laying competition of the Queensland Agricultural College was brought to a successful close on 31st March, 1916. Fifty-three pens competed. As usual, Leghorns prodominated, there being forty pens of white and one of brown Leghorns. Of the other breeds, there were seven pens of Black Orpingtons, two of Silver Wyandottes, two of Rhode Island Reds, and one of Plymouth Rocks. With few exceptions, the results are highly satisfactory. Many of the pens laid a total closely approximating the winners, and it can justly be claimed

that, with a little luck, any one of the leading pens might have taken first place. It must be recognised that luck plays a part. Incidental troubles with warts, moulting, &c., may prevent a pen from gaining first place and so winning a prize! Hence, to be among the leaders in such a competition is a guarantee of high egg-laying capacity equal to that of the actual winners.

Certain features require recognition. Many of the Leghorns are getting very small and weedy. In this there is a grave danger that the stamina of the breed will be undermined through breeding too exclusively for egg production. With the Black Orpingtons some of the pens are not so true to type as could be desired. That these competitions have done a great deal to improve the egg-laying capacity of the various breeds is undoubted. But it is important to preserve the type of the breed; hence in the conditions for our 1917-18 competition more exacting conditions will be imposed as regards trueness to type. As these egg-laying competitions have demonstrated that the lighter Mediterranean breeds are the highest layers, it is unfair to ask the heavier Asiatic breeds to compete on equal terms. One of the 1917 conditions, therefore, will be separate classes and prizes for the light and heavy breeds. This, we think, will do much to preserve such a good breed as Black Orpingtons. The six-hen pen competitions have served a good purpose, but their usefulness at present is mainly confined to demonstrating the quality of the flocks of various breeders. In view of this it seems imperative to insist that those accepted in the competition should be in a position to supply the market with both settings of eggs and young stock. That is, only *bonâ-fide* breeders should be admitted to the six-hen pen test. Another phase of poultry-breeding has been inaugurated at the College for this year's competition. One hundred and twenty pens, each to hold a single hen, have been erected. The object of this is to submit each hen to a year's test for the purpose of selecting the highest producing strain for breeding. This, we are convinced, will go far to still further improve the egg-laying capacity of the various breeds. The eagerness with which breeders seek for inclusion in the single pen test is sufficient evidence of the importance of this innovation. With the inclusion of the single hen test in this year's competition, which commenced on 1st April, 1916, an alteration in the prize list has been rendered necessary. These alterations are as follows:—

In addition to the usual prizes for competition, additional prizes of £3 3s., £2 2s., and £1 1s. will be awarded for 1st, 2nd, and 3rd aggregates for the winter laying, covering the period from 1st April to 31st July. Competitors in the single pen test must enter six pullets under conditions similar to those for the general competition. The aggregate of the eggs laid by the six pullets will render them eligible for prizes

in the general competition, and for this purpose replace birds are allowed. Special prizes of £5 5s., £3 3s., and £2 2s. are arranged for the 1st, 2nd, and 3rd birds in the single pen test. No replace birds will be eligible for these special prizes.

In the competition recently concluded, the total number of eggs laid during the twelve months was 70,848, an average of 1336·75 per pen, or 222·8 per bird. The total value of the eggs laid was £441 6s. 4d., while the cost of feed was £135 12s. 5d., thus leaving a profit, exclusive of labour, of £305 13s. 11d. This is the highest profit we have yet made in any competition, and is largely due to the very high prices at which eggs have sold during the year. Nineteen birds died during the year—one from enteritis, four from liver disease, and fourteen from heat apoplexy or its after effects.

As in previous years, great care has been taken to get the best results possible without unduly forcing the birds. For the benefit of beginners we are giving the average amount of food used each day. It must, however, be distinctly understood that these amounts must not be fed at all seasons of the year. For instance, say it takes 2½ oz. of food per day to keep a hen in good healthy condition when not laying, it will take over 4 oz. to supply her wants when laying heavily, so that you cannot lay down any hard and fast rule as regards the quantity to be fed. To keep the appetite good, without starving, is the fine art of feeding. The following is the average daily ration:—

Morning.—20 lb. pollard, 11 lb. bran, 21 oz. Sunlight oilcake, 24 oz. desiccated meat, or 18 oz. dried blood in place of the last-named. The above were all weighed dry, then mixed into a crumbly mass with water, cold in summer and hot in winter. At night—48 lb. wheat, except once a week, when oats or maize were used to give variety. Oats or maize were also used on Sunday morning instead of bran and pollard mash. The morning meal would average a little over 1½ oz. per bird or 10 oz. for the six birds, while the evening feed averaged 14 oz. per pen, or 2¼ oz. per bird. At midday a little soup meat, one handful for six birds, was fed about once a week, also green lucerne daily, one handful per pen. The feeding with green lucerne lasted until the beginning of December last, but since then we have had no green feed and were compelled to substitute lucerne chaff, about one-third of a kerosene tin soaked the previous night in boiling water. The latter, although it reduces the quantity of bran and pollard a little, is a poor substitute for green feed, and, in consequence, our records for December, January, February, and March were not up to those of last year. Fresh clean water was given every morning, while shell grit was always available. The quantities mentioned above were for the whole 318 birds. The weather conditions were very erratic, very hot weather being followed by cool changes, while the hot winds, as usual, caused several deaths. During July we had nine consecutive days of cold westerly winds.

Full details of the individual records, allotment of prize money, and balance-sheet of the competition will be found below.

CUTHBERT POTTS, Principal.

Competitors.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Grand Totals.
C. B. Bertelsmeier, Glenelg, S.A.	White Leghorns ...	117	100	93	118	147	161	164	135	140	131	117	107	1,530
J. D. Nicholson, Arncliffe, N.S.W.	Do. ..	102	106	110	117	138	147	148	142	130	143	132	115	1,530
A. H. Padman, Pirie street, Adelaide, S.A. ..	Do. ...	81	133	81	107	140	154	159	141	139	136	133	77	1,481
A. W. Bailey, Red Hill, Brisbane	Do.	66	120	110	133	138	145	151	129	124	125	122	88	1,451
Mrs. J. R. D. Munro, Sunnyside, Warwick ...	Do.	82	110	131	131	140	146	144	135	127	124	102	74	1,416
J. M. Manson, Milton road, Milton	Black Orpingtons	66	94	112	144	149	150	146	131	126	117	113	97	1,445
J. R. Wilson, Eudlo, N. C. Line	White Leghorns	85	100	108	130	142	135	153	135	131	129	112	81	1,441
E. F. Dennis, Herston road, Kelvin Grove ...	Do.	48	108	121	126	140	155	155	135	133	122	110	87	1,440
W. Parker, Sunnybank	Do. .. .	100	31	80	132	139	151	156	134	138	138	134	104	1,437
J. Gosley, Childers	Do.	83	110	115	146	140	150	142	120	129	120	95	83	1,433
King and Watson, St. Mary's, N.S.W. .	Do.	82	79	126	129	134	140	148	128	115	132	120	96	1,429
Kelvin Poultry Farm, Kelvin Grove	Do. . ..	43	114	123	136	143	149	152	118	112	122	127	88	1,427
J. M. Manson, Milton road, Milton	Do.	61	101	86	120	142	153	159	138	136	140	115	74	1,425
Jas. McKay, Gatton	Do.	122	109	132	144	139	132	130	119	110	102	101	85	1,425
H. Hammill, Kogarah, N.S.W.	Do.	61	93	99	126	146	136	139	124	120	139	140	100	1,423
C. Knoblauch, Hawthorne street, South Brisbane	Do.	68	95	95	108	133	148	147	133	129	127	137	97	1,417
E. A. Smith, Hawthorne street, Paddington ...	Do.	80	50	84	132	151	150	154	138	125	119	125	105	1,413
A. T. Coomber, Brown's Estate, Bundaberg ..	Do.	87	84	102	113	133	145	150	130	129	125	123	91	1,412
T. Fanning, Ashgrove, Brisbane	Do.	97	87	84	116	126	130	143	135	128	139	122	100	1,407
W. Purvis, Glanville Blocks P.O., S.A. ...	Do.	55	77	79	136	138	152	151	128	127	127	127	108	1,405
Moritz Bros., Kalangadoo, S.A.	Do.	56	63	98	123	132	142	143	130	128	139	118	112	1,384
E. A. Smith, Hawthorne street, Paddington ..	Black Orpingtons	23	17	92	150	151	152	157	138	131	126	132	112	1,381
R. Burns, Sladevale, Warwick	Do.	37	49	145	126	148	137	144	120	124	120	118	105	1,373
W. Lindus, Cessnock, N.S.W.	White Leghorns	6	65	103	140	143	147	148	125	131	122	129	113	1,372
O.K. Poultry Yards, Toowoomba	Do.	95	65	92	116	135	151	160	138	125	120	104	68	1,369
T. Fanning, Ashgrove, Brisbane	Black Orpingtons	54	54	119	140	154	147	140	132	112	115	110	78	1,355
J. H. Gill, Cheltenham, Victoria	White Leghorns	44	37	63	116	134	155	160	133	128	139	134	111	1,354
C. T. Clark, Cooper's Plains	Do.	80	80	116	124	130	141	138	126	121	108	108	79	1,351

Competitors.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Grand Totals.
Cowan Bros., Croydon, N.S.W.	White Leghorns	53	84	100	117	131	137	151	125	129	135	119	62	1,313
Mrs. Jobling, Plattsburg, N.S.W.	Black Orpingtons	123	128	119	135	135	124	114	102	101	106	93	60	1,340
E. V. Bennett, Kalangadoo, S.A.	White Leghorns	48	106	110	117	129	139	146	126	122	120	103	71	1,337
R. Burns, Sladevale, Warwick	Silver Laced Wyandottes ...	4	87	113	132	143	138	140	117	117	116	117	106	1,330
S. E. Sharpe, Innisfail	White Leghorns	120	88	87	131	141	148	138	112	98	97	73	82	1,315
Geo. Tomlinson, Boonah	Do.	33	68	129	128	134	140	125	119	114	110	122	93	1,315
E. Le Breton, McNab street, Milton	Do.	22	97	123	141	142	142	131	115	105	106	104	81	1,309
F. G. K. Clayton, Blacktown, N.S.W. ...	Do.	50	95	94	122	127	140	149	127	121	110	107	50	1,292
W. Meneely, Freestone Creek, Warwick ...	Black Orpingtons	39	72	118	128	145	131	133	111	111	113	106	79	1,286
R. Jobling, Wallsend, N.S.W.	White Leghorns	57	88	103	128	120	130	146	109	103	114	103	82	1,283
Derrylin Poultry Farm, Mutdapilly	Do.	42	78	84	132	131	133	115	129	101	124	103	71	1,280
Cowan Bros., Croydon, N.S.W.	Black Orpingtons	17	84	93	139	144	134	144	104	113	115	105	81	1,273
J. G. Richter, Aratula, Fassifern	White Leghorns	8	48	104	128	131	144	146	135	127	108	114	74	1,267
S. Chapman, Murphy's Creek	Brown Leghorns	0	24	86	101	117	130	132	137	141	136	133	123	1,260
Loloma Poultry Farm, Rockdale, N.S.W. ...	Rhode Island Reds... ...	26	47	80	107	134	146	145	129	123	121	114	83	1,255
W. Lyell, Graceville	White Leghorns	54	79	86	111	133	137	139	115	106	120	99	65	1,244
C. H. Turner, Aratula, Fassifern	Do.	30	63	93	122	124	142	137	118	102	107	114	82	1,234
J. Zahl, Boonah	Do. (No. 1)...	34	57	75	136	125	145	151	122	108	101	99	75	1,228
J. Zahl, Boonah	Do. (No. 2)...	53	74	71	110	123	125	127	115	117	105	106	75	1,201
F. Clayton, Blacktown, N.S.W.	Rhode Island Reds... ...	0	1	62	124	134	140	143	123	112	125	119	103	1,186
R. Jobling, Wallsend, N.S.W.	Silver Laced Wyandottes...	71	85	104	111	124	121	120	98	97	100	79	66	1,176
J. Aitcheson, Oxford street, Paddington ...	White Leghorns	18	90	123	96	115	127	137	124	105	102	89	46	1,172
E. Pocock, Palmer street, Windsor	Do.	31	52	64	100	133	144	144	118	110	100	99	59	1,154
W. H. Forsyth, Willoughby, N.S.W.	Do.	15	23	27	102	125	141	145	133	128	130	98	73	1,141
J. R. Johnstone, Warwick	Plymouth Rocks	0	0	0	85	111	121	121	121	105	93	84	30	871
	Totals	2,936	4,049	5,147	6,563	7,176	7,500	7,630	6,654	6,364	6,360	5,962	4,507	70,848

The following prize money was allotted to competitors: —

	£ s. d.	£ s. d.
C. B. Bertelsmeier, c/o Mrs. Vincent, Byron st., Adelaide, S.A.—		
One-half first and second prizes	5 15 6	
Monthly prizes, September and October ..	1 0 0	
		6 15 6
J. D. Nicholson, Lona, Flora st., Arncliffe, N.S.W.—		
One-half first and second prizes	5 15 6	
Monthly prizes, November and January ..	1 0 0	
		6 15 6
A. H. Padman, 46 Old Exchange, Pirie st., Adelaide, S.A.—		
Third prize	2 2 0	
Monthly prize, May	0 10 0	
		2 12 0
S. Chapman, Premier Stud Poultry Yards, Murphy's Creek, monthly prizes, December and March	..	1 0 0
Mrs. J. H. Jobling, Plattsburg, N.S.W., monthly prize, April	..	0 10 0
R. Burns, Sladevale, *viâ* Warwick, monthly prize, June	..	0 10 0
E. A. Smith, Hawthorne st., Paddington, monthly prize, July	..	0 10 0
T. Fanning, The Gap, Ashgrove, Brisbane, monthly prize, August	..	0 10 0
H. Hammill, Kogarah Bay, Kogarah, N.S.W., monthly prize, February	..	0 10 0
Total prize money awarded	..	£19 13 0

BALANCE-SHEET.

RECEIPTS.

	£ s. d.	£ s. d.
Entry Fees, 61 at 10s. (eight withdrawals) ..	..	30 10 0
Sales—		
Orient S.S. Co., 744 dozen	43 8 0	
Barnes and Co., 3,644 dozen (net) ..	247 15 6	
College Dining Hall, 1,516 dozen ..	119 12 10	
		410 16 4
Total Receipts		£441 6 4

Expenditure.	£ s. d.	£ s. d.
Prize Money	..	19 13 0
Food—		
Wheat, 249 bushels	84 12 7	
Oats, 6 bushels	1 12 2	
Hulled Oats, 6 bushels	3 15 0	
Maize, 9 bushels	2 12 6	
Bran, 158 bushels	10 11 2	
Pollard, 303 bushels	22 19 8	
Oilcake, 5 cwt.	3 3 0	
Bone Meal, 1 cwt.	0 13 6	
Desiccated Meat, 2 cwt.	1 16 0	
Dried Blood, 1½ cwt.	0 15 0	
Green Lucerne	1 10 0	
Chaff, 3 bags	1 1 10	
Soup Meat	0 10 0	
		135 12 5
Net Profit on Competition		286 0 11
		£441 6 4

HORSE WITH SORE SHOULDERS.

In the rush of field work much inconvenience and delay to the farmer, and excruciating pain to horses, may be prevented by care of the necks and shoulders. An improperly fitted or lumpy collar often causes a bruise, which later breaks into a running sore. A hard core or kernel is formed, which must be removed before this sore will heal. Often young or excitable horses will bruise themselves, even when supplied with well-fitting collars, by jerking, jumping, or uneven pulling. Some horses seem prone to collar sores, and must be carefully watched to avoid this troublesome injury. To prevent is more easy than to cure. Harden the neck and shoulders by bathing several times a week with salt water or vinegar in salt water. A little alum may be added. As a substitute for the old oakbark solution, try tannic acid dissolved in glycerine. This toughens the skin by tanning it.

When a sore begins to appear, which is usually characterised by a slight swelling, very warm and painful, do not work the animal for a day or two, if possible. If the horse cannot be spared, make a well-fitting felt pad, with the centre cut out, and place this over the injury. Healing powders, or ointments, such as zinc oxide, boric acid, sulphur and lard, or carbolated vaseline, may be used. If a watery serum runs from the sore, equal parts of tannic acid and powdered alum will prove efficacious. Severe caustics, such as blue vitriol, and the like, very often make the condition worse. Only soothing medicines should be used, allowing Nature full sway. If the shoulder becomes covered with sores, it is because they are contagious, the germs being found in the pus. A good blood tonic is often needed, and in bad cases the services of a competent veterinarian.—"Town and Country."

The Orchard.

A NEW BANANA PEST IN JAMAICA.

On a plantation in Upper St. Andrew, situated on the banks of the Wag Water, an insect pest has turned its attention to bananas, and apparently found conditions so congenial that it has adopted the banana stems and roots for its home and for its feeding ground, and for bringing up of its family.

A whole four-acre piece was found to be practically riddled by these borers and their larvæ. The borers are small beetles—weevil like, and the larvæ, which are hatched and fed in the banana bulbs and lower part of the stem chiefly, are of the same nature as those common in rotten wood, usually called "Makakas"—large fleshy grubs. Bananas were also found attacked in other fields on the same property and in other fields of small settlers in the same valley up the streams.

We understand that this weevil has been known for several years at Hope Gardens as infesting bananas without apparently doing much damage until very lately. It remained for the Entomologist, lately entered on his duties, to notice this borer, and recognise its similarity to a banana borer which has caused great loss in Fiji.

Inquiry elicited the fact that the borer was causing the death of bananas at Temple Hall Estate, in St. Andrew. A visit by the Entomologist there discovered that it was a very serious pest, requiring instant treatment, and he reported so. A few days later the writer visited the place, and instantly formed the opinion that it was such an alarming pest that measures to control it should not be delayed, and reported so.

Acting under the Protection from Diseases in Plants Law, 1915, the Department of Agriculture has taken the pest in hand.

All the agricultural instructors were at once informed of this pest, and asked to keep a lookout for it. We hope it will be localised—that is, prevented from spreading out of the valley of the upper waters of the Wag Water. But it would be easy for such a pest to get down the river to St. Mary.

The following is part of the Entomologist's report:—

"*Injury.*—The eggs of the beetle—a black weevil half an inch long—are deposited on the banana at the ground level, and the grubs commence boring into the leaf sheaths and bulb, these presenting the appearance as if riddled by shot. Generally the borings are confined to the basal part of the plant and bulb, especially the latter, but in instances the workings may extend 2 to 3 feet up the stalk. Plants in all stages are attacked, from the youngest sucker to the mature bearing plant. The grubs may invade the buds and young suckers from the parent

plant, in which case the younger generation of plants is lost. Established plants, if attacked, may be killed off before the bunch is produced, and if produced it is of small unmarketable size."

* * * * *

"The Fiji borer of the banana of the same genus (Sphenophorus) but a different species, has cost the growers of that colony thousands of pounds during the past ten years it has been with them, and it ultimately was found necessary to dispatch the Government Entomologist at considerable expense to Java, the original home of the pest, with a view to introducing natural enemies of the borer."

It is possible that a natural enemy could be found here; that would form the subject of inquiry and experiment. Whether the first treatment that suggested itself with lime will prove effectual will be known by the time this is read."—"Journal of the Jamaica Agricultural Society" (January, 1916).

"THE CYPRUS AGRICULTURAL JOURNAL."

We have for some time been in receipt of the "Cyprus Journal," from which we have from time to time published extracts on agricultural products of the island, of interest to agriculturists and fruitgrowers in Queensland. The journal, we are notified, will in future be issued as "The Cyprus Agricultural Journal," and will be published in January, April, July, and October, on or about the 15th of the month.

In the issue of January, 1916, the following hints to olive growers in Cyprus will be of value to olive growers in Queensland:—

1. Most olive growers in Cyprus are entirely ignorant of the proper methods of cultivating, pruning, and manuring olive trees and of combating the diseases which attack them. This in many cases is not for want of advice and instruction given them by the experts of the Agricultural Department. If only the more progressive farmers could abandon the fatal practice of gathering olives by beating their unfortunate trees with a stick (vaklisma), and if they would cease from pressing the olives when in a rotten, acrid, dirty condition, a distinct improvement would be made. This latter practice, which is almost universal in Cyprus, produces oil fit often only for lubricating purposes.

2. The old-fashioned process of piling up the olives in damp and dirty places should be abolished utterly, for by this system not only is the oil produced of very bad quality, but the yield is also diminished.

Olives should be gathered not by beating with a stick but by hand or with a special rake having wooden teeth (specimen of such I have given on several occasions in olivegrowing centres). The olives should be taken at once to the olive press. If this is too busy (as often happens) they should be kept not in heaps but in thin layers 8 to 15 c.m. thick, in places well ventilated, and should be turned over daily.

3. The olives, if healthy and kept under such conditions, considerably increase their oil contents while maturing in the store.

4. Any difficulty owing to insufficient room can often be overcome by the use of mats or trays such as are employed in the case of silk worms.

This method, apart from economising space, places the olives under the best conditions for preservation, and when these mat-layers are not too large, say, 1 m. 50 cm. long by 0·75 cm. broad, they greatly facilitate the handling, *i.e.*, the turning over, of olives, transport, &c. They are very inexpensive, and in the majority of cases must be regarded as indispensable, and their small cost will be very soon repaid out of increased profits, as they will certainly improve the quality and quantity of the olive oil produced.

Horticulture.

THE CULTIVATION OF CALADIUMS.

Mr. J. F. Bailey, Government Botanist, in replying to a resident of Port Douglas on this subject, says he understands that caladiums grow all the year round in that part of the State, and if it should be desired to dry them off, it would be advisable, after full growth has been maintained during the summer, to (say, in the cooler time of the year) gradually reduce the watering until the leaves all die away. Turn the pots on their sides and keep in a fairly dry position. While growing, abundance of water should be provided, but provision should be made for efficient drainage. Waterings of liquid manure once a week will be beneficial. For growing the bulbs we find a mixture of the following very satisfactory:—Turfy loam (chiefly), leaf mould, sand, cow manure, with a sprinkling of bone dust and soot (the latter brings out the colours). Different colours may be raised from seedlings obtained as the result of cross-fertilisation, either by hand or by natural agency.

PROPAGATING BOUGAINVILLEAS.

Cuttings from the previous year's growth of most varieties strike readily during the spring, but layering is the surest method.

Pieces of the thickened portions of the root also furnish plants. Notice how the suckers from such keep springing up when the portion above ground has been removed.

Forestry.

TREES AS WATER CONSERVERS.

The following paper by I. M. Sim, Honours Diploma in Forestry, on Forest Conservation, published in the "South African Farmers' Advocate" in October, is another valuable addition to the scientific literature on Forestry, which subject is to-day engaging the earnest attention of various Governments the world over. Such papers are of great value to us in Queensland as well as to European and to the United States Governments. We have frequently advocated the conservation of existing forests as well as the reafforestation of denuded areas in our State, in the interests not only of posterity but of our present day agriculturists and pastoralists. The denudation of our timbered areas—especially scrub lands, for agricultural purposes, and the consequent diminution of rainfall in such areas, has been the theme of many of our articles on Forestry in this Journal, and it has been pointed out how this serious result of clearing lands for agricultural purposes has proved to be injurious to those settlers who, for a time, benefited by the removal of the timber. This paper, showing, as it does, that the predecessors of the present inhabitants of South Africa were responsible for the treeless dry areas of that country, should surely be considered as a warning in time to the States of the Commonwealth of Australia.

Mr. Sim here shows how to combat certain destructive processes, how increased precipitation may be induced, and run-off minimised in the following words:—

The inhabitants of South Africa have to ask themselves in how far they and their predecessors are responsible for the fact that South Africa is for the most part a treeless and dry country. We have abundant proof that it was not always so, both in the naming of places—now semi-desert—by the early settlers and by the records left by the missionaries and writers of the early days of South Africa. For instance, the naming of places such as the Bloemfontein and Wildfontein show that, at the time these names were given, the flora must have been very different from that of to-day. Such examples of names, denoting a plenty of water and of flora are to be found throughout what are now some of the driest districts of South Africa; in the Cape Karroo, in the Free State, and in Bechuanaland.

In the archives of the Cape are to be found numerous "placaats," prohibiting the felling of timber on the Cape Flats, around Paarl and Worcester, and even further north towards Saldanha Bay. Dr. Moffatt, that veteran missionary of Griqualand, describes the forest existing even in his time near what is now Kimberley. Rains then were plentiful and reliable. To-day all is different. The herbage has been largely

destroyed, the ground surface is parched, and, as a consequence, the rains are less in volume and are irregular. When they do come, owing to the bare-ground surface and the streambeds being unimpeded by herbage, they flood the rivers and run to waste.

PLANTS AND PRECIPITATION.

Now it has been proved that there is an intimate connection between the plant life of an area and the precipitation and retentive power of that area. First, as regards the precipitation on an area, it is found that rainclouds are either attracted or repelled by the condition of the ground-surface. This is chiefly due to the amount of heat radiated by the ground. Clouds, or in their initial condition rather aircurrents laden with moisture, strike an area. Whether or not the moisture in the air is deposited depends on the heat of the ground struck. If this is warm—at any rate, warmer than the air-current—the result is the expansion of the air forming the current, and in the expanded condition it can hold more vapour and therefore will deposit none of what it originally had.

But, on the other hand, if the surface struck is cooler than the air-current, the result is the reverse. The volume of air is reduced and in proportion its water-carrying capacity is diminished. The vapour in the air-current is condensed and it primarily assumes the form of a visible cloud; it is then precipitated as mists and gentle rains. The problem at this stage then is to get the ground surface into the cool condition which induces gentle precipitation.

There are only two means by which this can be done; firstly, by having the surface so shaded by herbage as to be always cooler than the surrounding air, and secondly by having it, if bare, in such a condition that it is able to absorb and conserve moisture when precipitated and to evaporate it slowly but continuously when no precipitation is taking place: Ploughed land is an example of this condition.

The first of these means—the ground surface so shaded as to be constantly cooler than the air coming in contact with it—is the means devised by nature for inducing and retaining regular precipitation.

Naturally the country throughout even the present driest parts of South Africa had the ground-surface covered with vegetation. Forest was much more plentiful than it is to-day and savannah (single trees scattered amongst grass) and grass-land existed where there were no forest. The result was gentle and frequent rains. But this was a condition man could not permit to exist. The forests have been cut down, light let in and water drained off, and, as a consequence, the temperature of the forest areas has risen. The trees on the savannah areas (our thornvelds) have been cut for firewood and the grass has been burned until areas, once useful, productive thornveld, have been turned into korroo-veld with a depleted rainfall.

But so far I have only dealt with the precipitation of rain. For the air-currents to precipitate that rain they must receive the moisture from

somewhere. A large percentage is, of course, obtained from the sea, but the final saturation moisture is received from the land. To give off this moisture the ground must first have had it to give. Now the absorbing power of ground depends on the surface and on the free or restricted flow of water in the streambeds. It is in this connection that the greatest evil of veld-burning bears fruit. Fires, since the time of the first sighting of South Africa by the Portuguese navigators, have been of annual occurrence. The result, apart from the destruction of the herbage, has been the rendering of the ground-surface into a condition in which water cannot be absorbed.

To briefly deal with this question of the power of absorption of the ground being destroyed by fire, it must be remembered that the natural herbage performs a double function. The leaves shade the ground and by thus keeping it cool tend to induce the precipitation of rain, and the roots and dead leaves, mixed with the soil, form a layer of spongy humus which absorbs deposited moisture and prevents too rapid evaporation.

But the annual grass fires not only temporarily destroy the foliage and even the veld—this is a separate subject which cannot be gone into here—but they burn out and destroy this spongy layer of humus and bake the ground-surface, rendering it practically impervious to rain. From it deposited moisture rushes off to the nearest spruit or river. Every Kaffir and sheep track acting as a drain, the result is obvious.

The next point is to deal with the streams themselves. These, in the first instance, were all running, supplied by the stores of water absorbed by the spongy layer of humus. But, when this humus was destroyed the supply of water was reduced. If this reduced supply of water was to continue to flow it was at least necessary for the evaporation to be reduced to a minimum. Instead of this, grass fires destroyed the scrub and other herbage along the banks and exposed the banks and increased the evaporation; for, it must be realised, the evaporation from an open stream with exposed banks is several times greater than that from a stream with trees, scrub, and undergrowth along its borders.

Not only is the evaporation increased by the destruction of the stream-bank herbage, but a second evil is brought about. With herbage on the banks a certain amount of resistance is offered to the flood waters, allowing these waters to soak in and lessen their velocity. With unimpeded banks, the water runs to waste too rapidly for any soakage to take place or for any good to be wrought to the country.

Now all these desiccating processes—and many others which it is impossible to deal with in detail in such an article as this—have been brought about by the destruction of herbage. The question that arises then, is how these destructive processes can be combated, increased precipitation induced, and the run-off minimised. There is only one method and that is by proper and suitable reclothing with herbage the

bared areas. The first step should be the absolute prohibition of grassfires, for with them as an annual menace, no permanent good can be brought about. Australia, the United States, and other countries have imposed the severest penalties on grass-burning. Once this is put down, the greatest cause of desiccation in South Africa would be abolished. Nature would slowly tend to reassert herself and to improve the water supply. But we cannot afford to wait for the natural processes, we must assist nature and this assistance must take the form of suitable reafforestation.

REAFFORESTATION.

What is suitable reafforestation? The three primary necessities are all I have room to touch on here. They are—

1. Entire conservation (not biassed by political aims) of our indigenous forests.

2. Reafforestation of the mountains—since they are first struck by the air-currents containing moisture—with suitable humus-producing trees, such as pines and cypresses.

3. Entire protection and, if possible, reafforestation of our stream-banks with suitable trees and shrubs. These must be species with a minimum of evaporation, and in this respect our indigenous shrub, Buddlica (Zalichout), Rhus, Combreyhim, Cunonia, Enythrima and many others are of the first value.

Through the limitations of space, I am only able to touch the fringe of a great subject in this article, but the outlines are sufficient to show how South Africa, the land loved by all her inhabitants, is suffering by desiccation which can be prevented. It is our duty both individually and collectively to convert the present processes of deterioration into processes of the greatest improvement for our land.

SALE OF MAMMOTH CHEESE.

In the December issue of this Journal we described, as the largest cheese ever made, one from Lawrence County, New York, which was sent to the Panama Exposition at San Francisco, the weight of which was given as 6 tons. A cheese made in Canada in 1892 weighed 22,000 lb. net, or 11 tons. A big New York State cheese, weighing 1,200 lb., exhibited at the Panama Exposition, was recently cut and sold. The receipts totalled between £600 and £700. So says an exchange. There must, however, be some mistake about the weight and returns from the sale of this cheese. First of all, it was by no means the largest cheese ever made, and secondly, in order to realise £600, it must have been sold at the rate of 10s. per lb. We have no information as to what the 6-ton New York cheese, if sold, realised, but at 10s. per lb. the result would have been £6,720. There must be a mistake somewhere.

Tropical Industries.

DESTRUCTION OF SUGAR-CANE PESTS.

A NEW MOTH PEST.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist to the Bureau:—

The month has been devoted almost exclusively to the study of an important branch of control applicable to the grub stage of cane-beetles, which aims at the discovery of some simple yet effective method of destroying them whilst in their earlier stages.

It is satisfactory to be able to state that experiments conducted during March, and those now in hand, have been attended with marked success, and I hope very shortly to be in a position to report details of a discovery that may prove to be of economic value.

It will be of interest to mention the occurrence at Meringa and Gordonvale of a new moth-pest of sugar-cane hitherto unrecorded. Early in the month thousands of slender greenish-brown caterpillars were noticed stripping the leaves of both young and old stools, often to the mid-rib, over areas of considerable extent. This damage was confined principally to plantations on which weeds had been allowed to mature, these having no doubt served to attract the moth in the first instance. Apparently the caterpillars had quickly forsaken native food-plants and turned their attention to cane leaves as being perhaps more palatable than the foliage of smaller grasses and weeds. A number were collected for breeding at the laboratory, and in due time pupated on the leaves, the pupa being concealed in a short tube previously constructed by the caterpillar by webbing together the opposite edges of a leaf-blade. Contrary to expectations, very few were parasitised, fully 90 per cent. yielding moths and the remainder specimens of a tachinid fly, but no hymenopterous parasites. The perfect insect, which measures about 1½ inches across the expanded wings, is slaty-brown with a darker stripe bordered by light gray—very conspicuous in the male—running obliquely from apex to hind margin of fore wing; and has two suffused smoky bands crossing the centre of hind wing and parallel to its outer margin, the one nearest the edge terminating in a dark blotch on the upper angle. Dr. A. J. Turner, of Brisbane, who has identified this insect as *Mocis frugalis* Fab., tells me that it is a widely distributed species ranging from Port Darwin to Sydney, and occurring also in many other parts of the world.

Its appearance at Gordonvale in such numbers may, I think, be attributed to the recent drought, which has temporarily upset the balance of nature, thereby affecting the normal rate of increase of many kinds of parasitic and predaceous insects.

The familiar little black ant (*Pheidole megacephala*), for example, has received a severe check in certain localities near Gordonvale. During the earlier months of last year it proved a veritable pest at the laboratory, necessitating the use everywhere of ant-proof tables; while outside among stools of cane and in land under "blady grass" it swarmed literally in millions, its nests being so numerous that scarcely a square yard of ground remained uninfested.

It occurred more or less freely, too, in canefields, where, by devouring injurious caterpillars, &c., it probably helps to thin the ranks of more than one of our many enemies of sugar-cane. Few insects escape the attacks of this cosmopolitan voracious foe that systematically explores every plant, hole, and crevice in search of prey. Since the drought, however, not an ant is to be found in the laboratory building, and they have practically disappeared from the soil under cultivation.

FIFTY MILLIONS A YEAR.

Under this caption the Federal Sugar Refining Company have published an advertisement in the Washington "Herald," in which the argument is made that a consumption tax should be levied on sugar that would increase the Government's revenues 50,000,000 dollars.

The idea of singling out sugar for a consumption tax, or for an excise duty, has no parallel except that of the war tax levied on baled cotton during the civil war*. A war tax of a cent a lb. on cotton on the 5,000,000 bales of cotton consumed in the United States would produce a revenue of 250,000,000 dollars. A tax of a cent a lb. on wheat consumed in the United States would produce something like 300,000,000 dollars, and at the same time would leave those products untaxed for export.

There is no reason why sugar, or cotton, or wheat, should be taxed, but if they are taxed, then they should be all taxed similarly. We should say that no Government on earth would undertake such taxation unless it were one of the expiring efforts of the young Turks, or of the enterprising Japanese.

The Federal Sugar Refining Company has been carrying on this sort of propaganda for many years, apparently to spite the American Sugar Refining Company, their chief opponents in the sugar refining business, and yet their coadjutors in their monopolistic control of the New York sugar market. Wealth, as well as poverty, brings together some strange bedfellows, and the New York combination of the American Sugar Refining Company, the Spreckels interests, and the Arbuckles form a combination that has been making an immense amount of money out of the sugar producers. Their efforts have depressed the prices of

* This is obviously an error. Excise was levied on all sugar produced in the Commonwealth of Australia between 1901 and 1914. The rate was, at first, £3 per ton, and was later increased to £4. Excise was charged on the refined product.—Ed. "Q.A.J."

sugars so far in the western world that they have reached about a cent a lb. below the normal level, and the Philippine sugars produced in the Far East have found a better market for sugar at home, in the Far East, rather than to send them to the United States to be admitted free of duty and thus gain the cent a lb. advantage that they would secure in that way. These parties, the New York combination of buyers, apparently have at times their differences among themselves, but join hands with singular unanimity when it becomes a question of price for the producers of sugar.

In the sugar trade the report has been circulated, so we have been informed, that the Federal Sugar Refining Company could scarcely turn out as fine sugars as the American Sugar Refining Company, and therefore at times was discriminated against by discreet buyers because of the lower quality of their sugars of the same official grade. Whether this was exactly true or not we are unable to say, but evidently there is some element of discord existing among these three central figures of this great monopoly that has only been broken into now by the New York sugar future market, into which millions of money will enter when sugars are forced below what seems to be fair prices.

In regard to the revenue duties derived on sugar, which are now of such great importance to the Federal Government, these gentlemen advocating the imposition of an excise, or consumption tax, are unquestionably aware that the English Government has refused to do anything of the kind in connection with the Cantley beet sugar factory in Northern England. The import duties on sugars have recently been considerably advanced in England, and not one word of opposition was heard from any one in Parliament against letting the Cantley factory derive whatever benefit it could from the incidental protection that the sugar duties allow them. France and Germany allow their colonial sugars similar advantages, and we feel sure that Congress will see through the disreputable machinations of the employees of the Federal Sugar Refining Company in the literature that they have been circulating, as well as in the Washington advertisement hereinabove referred to.—"Louisianna Planter."

ACETIC ACID AND THE RUBBER INDUSTRY.

Although numerous other methods have been suggested and tried, it is a fact that 99¾ per cent. of all plantation rubber is coagulated with acetic acid. The acetic acid is added to the strained latex, which is then poured into the coagulating vessels. "Considerable alarm arose among rubber planters" (says the "Fiji Planters' Journal," April, 1916, quoting from the annual report of the Director of Agriculture, Ceylon, 1914), when on the outbreak of war it was realised that supplies of acetic acid, almost all of which came from Germany and Austria, were likely to run short, Mr. Campbell, who was at that time Acting Government Chemist, immediately began investigating the question of being able to provide acetic acid or some substitute locally, and numbers of private investigators also set to work on the same problem. Cocoa

juice, cocoanut water, and cocoanut vinegar were all found to be suitable coagulants, especially cocoanut water, which is now being regularly used on some rubber estates. At Peradeniya, pyroligneous acid from the destructive distillation of wood and of cocoanut shells was produced by an improvised still and the results made public. Supplies of acetic acid soon began to arrive from England, and the urgency of the question passed, but results which will probably prove of permanent benefit to the island remain. Acetic acid can be made cheaply and in ample quantity from cocoanut shells. It is not sufficiently clear in colour for the coagulation of rubber that is to be made into first latex crepe, but good, clear smoked sheet can be and is being made in large quantities with it. Ceylon produces enough cocoanut shells to provide sufficient acid for all the smoked sheet made in the island—perhaps in the whole East—and I think our resources in that respect may very likely be turned to good account.

The cost of acid works out at much less per lb. of dry rubber with crude acetic acid prepared from cocoanut shells than with the imported product. Mr. Bamber has shown that considerable economy could be effected by using acetic acid prepared from cocoanut shells over the imported product. He calculates that the cost of acid per lb. of dry rubber is 0·08 cent in the case of the crude product, as compared with 0·39 cent to 0·65 cent when ordinary acetic acid is used.

TOBACCO.

The following interesting paper on Tobacco-wilting, Curing, Fermentation, Chemical Changes, &c., was read before the Board of Agriculture, Jaffna, Ceylon, and appeared in the "Tropical Agriculturist," Ceylon, for March, 1916:—

WILTING.

The wilting of tobacco which takes place immediately after harvesting is due to evaporation, and is not strictly a part of the curing process. Although thorough wilting hastens the curing practically no chemical change is produced in the leaf. In fact, plants often become wilted during the heat of the day in the growing season.

CURING.

Tobacco curing, in the broad sense of the term, implies all the changes which take place in the curing shed, fermenting house, or ageing room. The term, as it is ordinarily used by tobacco growers, refers only to the change which occurs in the curing shed.

Certain requirements must be met in order properly to cure tobacco by any method. The leaf must be sufficiently ripe and in sound condition. Any portion of a leaf that has been killed by excessive evaporation, bruised, sunburned, or subjected to poisonous gas, can never be properly cured. It is therefore a life process, and the plant must be kept under suitable conditions as regards heat and moisture, to prolong life as the curing proceeds. At a temperature as low as 60 degrees

Fahrenheit, curing practically ceases, though evaporation may continue, if the curing shed is too open, during dry or windy weather. At a temperature of 130 degrees Fahrenheit, the plant life is killed. There is little danger of extreme temperature in Ceylon, but these facts should help us to understand that the curing is a life process, and amounts to more than the mere drying of the leaf, which could easily be done outside this range of temperature. It is also quite possible to cure the leaf without sufficient drying, in which case, pole sweat, stem rot, or mould, are apt to develop. If tobacco is too closely crowded in a room, and the stems of the leaves become brittle, it is an indication that pole sweat is about to develop. The tobacco should immediately be more widely spaced in the barn, and more ventilation given. If, on the other hand, the tobacco is drying too rapidly, and becoming crusty and crisp, prior to browning, the curing shed should be more tightly closed. If necessary, the floor should be sprinkled with water or the tobacco crowded more closely. Tobacco loses from 12 to 30 per cent. of dry matter during curing. Tobacco cured on the stalk always loses more in weight, sometimes twice as much as it would lose when harvested by the single leaf method. This, though contrary to the general belief, is a proved fact.

The curing process is variously modified according to the use for which the leaf is intended, the difference in procedure pertaining chiefly to the rate of drying; this, in turn, is controlled mainly by the use of artificial heat. The character of the cured product is greatly modified by these different methods, and it is necessary to consider separately those cured with, and those cured without, the aid of artificial heat. The most widely practised methods are air-curing, sun-curing, flue-curing, and open fire-curing.

The curing may be divided into two periods: during the first the leaf remains alive, while in the second, the changes which occur have no connection with its life activities.

Practically all the cigar tobaccos and the immense quantities of White Burley tobacco are cured without the use of artificial heat, or by what is known as

AIR CURING.

After harvesting, the tobacco is hung up in an enclosed roomy shed where the leaf undergoes a slow process of *starvation*, unless it is killed by bruising, heat, or by too rapid drying. Of course, the leaf must have food in order to remain alive, and this comes from the reserve supply which has been stored up. The ripe leaf is very rich in starch, and one of the important changes in the curing is the disappearance of most of this starch, which is consumed by the living portion of the leaf itself. If the leaf is prematurely killed there is no means of removing this starch, and the tobacco is harsh, lifeless, and strawy. After the starch is nearly all used up, it is probable that some of the nitrogenous constituents are attacked as a last means of prolonging the life of the residual living matter.

Along with these changes in composition, the green colour is replaced by a lemon yellow. This is a characteristic of all tobaccos, whatever the curing method may be, if properly conducted. The green

colouring matter, called chlorophyll, is peculiar to all plants, in very similar, but not identical forms. During the period in which the leaf tissue undergoes starvation, this green colouring matter is more or less completely changed into colourless substances and the appearance of the yellow colour marks the approaching death of the leaf, the yellow colour indicating the end of the first period of curing.

In the second, the changes which take place are not dependent on life process, and are quite different from those occurring in the first stage. They consist mainly in the further breaking up of the products formed in the first stage. One of the most important changes is the brown colour, formed by a process of oxidation, which takes place after the cells are dead. As soon, therefore, as portions of the leaf die, they at once begin to turn brown, provided sufficient moisture is present. The two essentials for the development of the brown colour are a supply of oxygen from the air, and sufficient moisture. If the drying has proceeded too slowly and excessive moisture is still present, development of the brown colour will proceed too far, causing the leaf to cure dark.

The most favourable temperatures for air-curing are between 70 and 100 degrees Fahrenheit, and the relative humidity should be about 85 per cent. Under these conditions moisture will gradually lessen and the curing will proceed smoothly.

SUN CURING

is used in few localities as a modification of the air process employed for curing certain types of plug or chewing tobacco, by being hung on scaffolds and exposed to the sun for several days. It is then transferred to the curing shed and finished off by the regular air method. This method has not been investigated.

FLUE CURING.

The distinctive feature of the flue method is that the curing shed is constructed as nearly airtight as possible, and provided with a system of large pipes or flues, diffusing heat which is completed within a few days, the object being to prevent smoke from coming in contact with the tobacco.

Heat is applied immediately after the tobacco is hung in the barn and rapidly increased to about 100 degrees Fahrenheit. At this temperature the tobacco yellows very rapidly, provided sufficient humidity is maintained. As green tobacco contains about 75 per cent. of water, which is constantly being given off, it is easy to keep the air moist under this temperature, if the barn is sufficiently tight. When the tobacco is almost completely yellowed, the temperature is rapidly increased, finally reaching 175 or 180 degrees when the curing is completed. At the same time ventilation is provided, in order to bring about a rapid drying which will kill the leaf and fix the yellow colour. If not done at this stage the leaf would turn brown, and resemble in

colour, tobacco cured by the other methods. The killing of the leaf in this process before the yellowing is completed, fixes some of the carbohydrates in the leaf, and when the high temperatures are reached these give a sweet smell and flavour.

One of the principal factors is the bright lemon yellow colour, and the two prime conditions are the right kind of soil and proper control.

FIRE CURING

is universally adopted in heavy export or shipping tobaccos. The tobacco is hung in a moderately tight curing shed and allowed to begin yellowing before applying heat. Slow wood fires are started on the floor beneath and gradually increased in intensity as the curing proceeds. The entire process takes from one to two weeks and cures a dark brown leaf.

The tobacco is exposed to the smoke from the open fires and consequently it acquires a characteristic flavour and odour. The creosotic substances absorbed from the smoke possess antiseptic properties and prevent injury to the leaf in shipment to foreign countries.

FERMENTATION.

In the general understanding of the term, only cigar tobaccos are fermented. The fermentation is of great importance and the curing process must be conducted with the idea of developing oxidising enzymes, upon which largely depends the success of the fermentation. In the curing of cigar leaf an attempt should be made to have the leaf become dry, and brought in case, once in twenty-four hours, when the curing is nearly completed. More of the oxidising enzymes are formed in the ribs of the leaf than in the tissues, and the alternate drying and moistening of the leaf brings about a movement of the contents of the ribs out into the leaf web. The longer the ribs and stem are permitted to live the greater will be the amount of enzymes formed.

Fermentation develops the aroma of the tobacco, depending mainly on quality of leaf and the skill of the operator to regulate that fermentation. 23 to 24 per cent. of moisture ensures proper fermentation; a higher per cent. causes liability to decay, and may result in failure. The proper condition is soon learned by experience and the pliability of the leaf to touch is the only test.

Several methods of fermentation are practised but fermentation in bulk is the most modern and widely practised. Rooms heated with steam and kept at a temperature of from 75 to 80 degrees Fahrenheit with humidity maintained at 80 to 90 per cent. and even as high at times as 100 per cent. are best. Different grades of tobacco should be bulked separately and given different treatment. For example, wrapper leaves of light shade must not be fermented so heavily as the filler leaf, as they will become too dark. Fermentation varies according to the presence of oxidising enzymes.

From 3,000 to 5,000 lb. of the light grades, 8,000 to 10,000 lb. medium, and 10,000 to 30,000 lb. ordinary fillers, are the average bulks. The greater the fermentation desired the greater the per cent. of moisture allowed when bulked. The wrappers are therefore in a somewhat drier condition than the fillers. These bulks may be from four to five feet wide, from four to eight feet high, and of any length. The bulk should be made on a platform raised a few inches from the floor. The butts are placed toward the outside of the bulk, the tips toward the centre. The first row is laid with the butt ends even with the edge of the bulk, the second, butts resting on about one-third of the tip ends of the first, and so on with the third row. Three rows in from each side, or six rows in all, is as much as will ordinarily be required for each layer. A perforated tube is placed in the centre, one end being left exposed at the side, into which a thermometer can be inserted. The temperature should be watched very carefully, especially during the earlier stages of the fermentation. When the bulk is completed, it should be covered with canvas blankets, or rubber sheeting. No weights should be placed on the bulk, when the fermentation is being done in a properly constructed room; the idea being to leave sufficient space between the layers to permit the escape of undesirable gases which are formed during fermentation.

The temperature will begin to rise in a short time and continue to increase at the rate of from 5 to 15 degrees a day, depending on the percentage of moisture present, until the temperature reaches 130 degrees, when the bulk must be broken down and rebuilt. In rebuilding, the tops and sides of the old bulk should form the centre of the new. Each bunch should be given a shake to free it from any of the objectionable products of fermentation, and to lessen the liability to rot and mould. The temperature of the tobacco will be lowered in handling to about the temperature of the room. The bulk will again heat up but not so rapidly, perhaps, as the first bulk. In eight to twelve days the thermometer will indicate that the pile has reached a heat of 125 or 130 degrees, or that, perhaps, it has ceased to rise in temperature and remains stationary. In either case the bulk is to be rebuilt.

This process of bulking may have to be repeated several times, or until the best possible aroma is obtained. If the process be carried too far, the desirable products obtained in the earlier stages may be destroyed and the tobacco rendered unfit for smoking.

AGEING.

Ageing may be described as partly a process of slow fermentation and partly an oxidation of leaf contents without the agency of enzymes. It softens and mellows a tobacco, taking away its rawness and bitterness, as well as disagreeable odours, and improving both the aroma and burning qualities. All tobaccos require ageing, but cigar tobaccos, which have been through the intensified form of fermentation, require less ageing. Pipe, cigar, cigarette, and chewing tobaccos are aged from two to five years before they develop their finest qualities.

WHY SOME TOBACCOS ARE NOT FERMENTED.

In the first place, all types cannot be made to ferment properly, any more than certain good varieties of eating apples can be successfully cooked. Just as some people prefer at times eating apples to cooking apples, dried or tinned apples to cooking apples, so pipe, cigarette, cigar, and chewing tobaccos are in demand, and are grown and cured to meet the various tastes of the consumers.

CHEMICAL CHANGES PRODUCED BY FERMENTATION.

During the fermentation of tobacco there is a loss of as high as 15 per cent. in weight, partly due to loss of moisture, and partly to loss of solid matter, through the decomposition of some of the products which are given off in the form of gases. The presence of ammonia is easily detected by the odour in the fermenting room. The starch changes to sugar, which in turn is usually destroyed in the fermentation.

The enzymes attack the protein contents of the plant cells which continue to be destroyed throughout the fermentation. With the decomposition of the protein contents, "Amino" compounds are formed. There is a loss of nitrate, a decrease in nicotine, and also a large decrease in tannin, the substance which imparts the bitter flavour to tobacco. There is a disappearance of a portion of the fat contents. If much fat or protein is left in the leaf it will create products, when smoked, destructive of the finer aroma; one of the advantages of fermentation is that it does away with these compounds. There is also a decrease of the resin and gums, which seem to bear a close relation to the aroma. It is thought to be quite probable that these split up into other products that are aromatic. Citric, malic, and oxalic acids are present in the cured leaf, and the citric and malic acids may be partly transformed to acetic and butyric acids. These acids certainly have something to do with the aroma; the presence of malic acid is supposed to render the leaves soft, pliable, and elastic. Fermented tobacco is said to have "grain." This grain is a product of the oxidation in the fermentation, and is due to the formation of crystals of calcium oxalate, and manufacturers consider it an evidence of good tobacco. It is certainly an evidence of thorough fermentation. During the fermentation there often appears an efflorescence on the leaf, called "saltpetre" or "light mould"; this is due to the presence of potassium, magnesia, sodium, calcium, and nicotine salts, which may be present in excess, and are forced to the surface during fermentation. They are supposed to injure the quality of tobacco, and are usually removed by spraying with a 4 per cent. solution of acetic acid.

A great many chemists are interested in discovering various changes which take place in tobacco during the curing and fermentation, and from time to time discoveries are made. It is thought that there are possibly a number of the changes which are not yet understood, and the result of future investigations will be awaited with interest.

B. F. SCHERFFIUS,

Government Tobacco Planter.

Jaffna, 29th February, 1916.

Zoology.

THE MONGOOSE AS A SNAKE AND RAT DESTROYER.

Somewhere about the year 1900 it was proposed, owing to the depredations of rats in the canefields, and the numbers of snakes, especially carpet snakes, in the farming districts, to introduce the mongoose from the Barbados. Fortunately, wiser counsels prevailed, and this animal was prohibited. When the sugar-growers of Barbados introduced this rat-destroyer the desired effect was produced, but when there were no more rats to be got, for what of these rodents remained changed their habit of life and made their nests in trees, the mongoose changed its diet and turned its attention to ground-nesting birds, to poultry of all kinds, and eventually became such a scourge that in 1904 an Act was passed by the Legislature of that island offering a reward of 3d. per

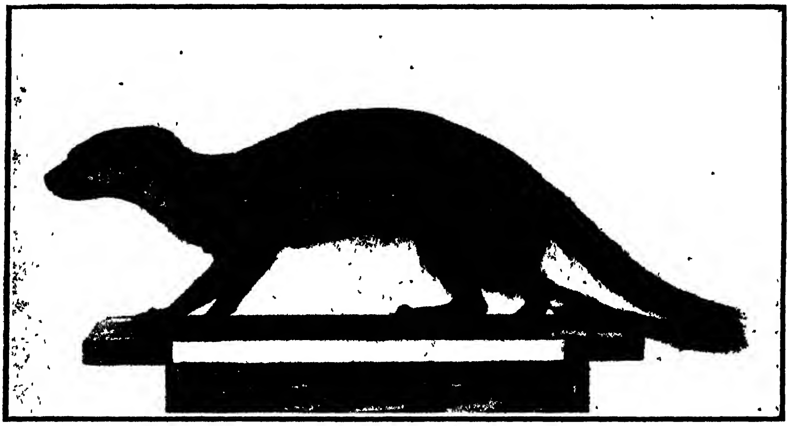


PLATE 19.—THE MONGOOSE.

head for the destruction of the mongoose, and providing a penalty not exceeding £5 to be imposed on any person who should import or attempt to land a mongoose, or even the head of a mongoose. Why the head of the animal should be an object of solicitude we fail to understand. The history of the cattle tick in Jamaica is bound up with that of the mongoose. In 1872 nine mongoose were imported by a Mr. Espent in the hope of exterminating the cane rat, which was making impossible the cultivation of sugar. The mongoose throve and multiplied, and sugar-cane and cocoa-growing were made possible. But when the rats had become few and the mongoose many, between tree-climbing rats and the latter the birds suffered terribly, and the disappearance of insectivorous birds was soon followed by the spread of ticks, which previously the birds had kept under, until the ticks became a perfect scourge.

Yet in 1909 the St. Lucia (W.I.) Agricultural Society imported sixty mongoose from Barbados, and an additional 100 from Barbados or Trinidad. Opinions on the usefulness or destructiveness of the mongoose

appear to differ considerably in the West Indies. The "Journal of the Jamaica Agricultural Society" about that time, writing on the subject, stated that there was no plague of mongoose in Jamaica, and never had been, and that estates then that boasted of trapping hundreds of mongoose a year would within a short time require to fight plagues of rats, use poisons by the hundredweight, traps by the score, and spend several hundreds of pounds a year. This article we published in the issue of this Journal for July, 1909, and added a footnote in which we expressed our agreement with the editor, but have since had reason to alter our opinion.

In March, 1916, under the caption "An Open Season for the Mongoose," in the monthly bulletin of the State Commission of Horticulture, California (vol. V., No. 3), appears an excerpt taken from the Year Book, United States Department of Agriculture, 1898, p. 94, corroborating the statement that "the establishment of the mongoose in California would mean ultimately the annihilation of our ground-nesting birds and serious interference with our poultry industry." Following is the excerpt:—

"Still the mongoose increased (*i.e.*, in the W. Indies and in Hawai), and its omnivorous habits became more and more apparent as the rats diminished. It destroyed young pigs, kids, lambs, kittens, puppies, the native "coney" or capromys, poultry, game, birds which nested on or near the ground, eggs, snakes, ground lizards, frogs, turtles' eggs, and land crabs. It was also known to eat ripe bananas, pineapples, young corn, avocada pears, sweet potatoes, cocoanuts, and other fruits (fallen, presumably, as the mongoose is not a tree climber.—Ed. "Q.A.J.") Towards the close of the second decade the mongoose, originally considered very beneficial, came to be regarded as the greatest pest ever introduced into the island. Poultry and domesticated animals suffered from its depredations, and the short-tailed capromys (*Capromys brachyurus*), which was formerly numerous, became almost extinct except in some of the mountainous districts. The ground dove (*Columbigallina passerina*) and the quail dove (*Geotrygon montana*) became rare, and the introduced bobwhite, or quail, was almost exterminated. The peculiar Jamaica petrel (*Aestrelata caribbæa*), which nested in the mountains of the island, likewise became almost exterminated. Snakes, represented by at least five species, all harmless, and lizards, including about twenty species, were greatly diminished in numbers. The same thing was true of the land and fresh-water tortoises and the marine turtle (*Chelone viridis*), which formerly laid its eggs in abundance in the loose sand on the north coast. The destruction of insectivorous birds, snakes, and lizards was followed by an increase in several injurious insects, particularly ticks, which became a serious pest, and a Coccid moth, the larvæ of which bore into the pimento trees. In 1890 a commission was appointed by the Government to consider whether measures should be taken to reduce the number of the animals, and the evidence collected showed conclusively that the evil results of the introduction of the mongoose far outweighed the benefits rendered to the sugar and coffee plantations."

For the peace of mind of those to whom this article is particularly addressed—the crop producers of the State of California—their Horticultural Quarantine Division assures them that there is not a living mongoose in the State to-day, neither is there going to be as long as the

Quarantine Service is master of the situation at the maritime ports of entry in California; and over and superior to this assurance is the fact that the Federal Government maintains an exclusion against this pest through its Bureau of Animal Industry, and this long capable arm extends to and controls every port of entry in the United States.

The introduction of the mongoose into Queensland, so much advocated some years ago, has been absolutely prohibited, and we are hopeful that the pest will never make its appearance here. Even rabbits would be preferable. We may incidentally remark that mongoose is both singular and plural, the latter being neither gooses nor geese, just as the plural of reindeer is the same as the singular.—[Ed. "Q.A.J."]

THE AMERICAN AND THE AUSTRALIAN OPOSSUM.

We lately received a letter from a correspondent asking for information as to the nomenclature of the so-called Australian opossum. We referred the question to Dr. R. Hamlyn-Harris, Director of the Queensland Museum, who kindly replied as follows:—

The opossums of South America and the so-called opossums of Australia belong to distinct families of the Marsupialia, the former being known as *Didelphyidæ* and the latter as *Phalangerinæ.* Strictly speaking, the word "opossum" should not be used for Australian animals, as the term was first used for the American marsupials, but it would indeed be difficult to change the popular local name. It would be more correct to designate our "opossums" as *Phalangers.* The so-called "flying squirrel" should, of course, be called "flying phalanger," as it has no relationship with the true squirrels. The dual term "Australian opossums," as distinct from "American opossums," would probably solve the difficulty so far as popular literature is concerned.

RICE IN THE NORTH.

Mr. J. F. Keane, of Carbeen, is an enthusiastic rice planter near Mareeba. His crop this season, of which he has sent us a sample stool, averages from 4 to 6 feet in height, each stool averaging about twenty ears. The yield this year he estimates at 40 bushels per acre. He will have a certain quantity of seed for sale at 2d. per lb., which seems a reasonable price for seed acclimated for five years. He states that 24 ounces of paddy will sow one acre. A sowing of 3 ounces resulted in a crop of 5 bushels. No wonder rice is the emblem of prolificacy. We wish him all success and many emulators.

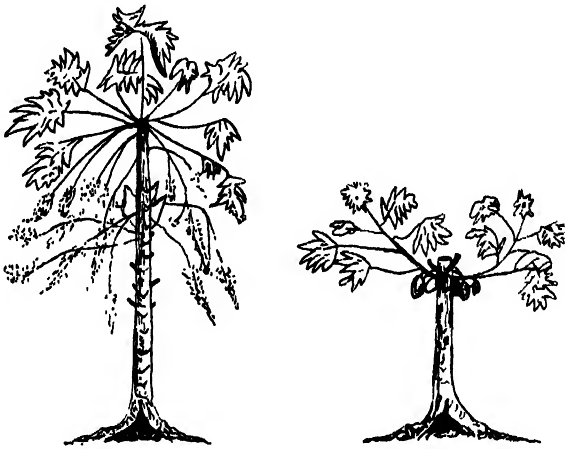
BLACK SPOT IN TOMATOES.

A Sydney suburban gardener, who has been doing a little experimenting, has proved to himself that water with the merest trace of permanganate of potash in it will banish black spot in tomatoes. His directions for use are:—Two teaspoonsful of the permanganate of potash to three gallons (three-quarters of a kerosene tin) of water. He sprays the tree under and over and through, thoroughly drenching every leaf and twig. One application, he says, works a perfect cure.

General Notes.

CHANGING SEX OF THE PAPAW.

The method of changing the sex of the male papaw tree by cutting it down to about three feet of the ground was accidentally proved in a garden at Milton this season. The owner cut down three male trees and inserted a female shoot on top of each. Owing, probably, to the



very dry weather all these shoots died, and two of the trees were rooted out. The third was left, and it sent out two strong shoots about a foot below the top. These shoots bore females flowers, and three fruits matured, one of them remaining on the tree last May, as shown in the accompanying illustration.—[Ed. Q.A.J.]

Answers to Correspondents.

PRICE OF CHICORY ROOTS.

"CHICORY," Cairns—

Any doubt as to the condition of chicory roots when placed on the market by South Australian growers, who receive £3 7s. 6d. per ton, is set at rest by Mr. Finnie, editor of the "S.A. Journal of Agriculture," who has informed us that £3 7s. 6d. per ton is the rate at which producers are paid for the roots just as they clean them and put them on the trucks. Averaging 11 tons of roots per acre, and the price as stated, and the expenses of production as given in our issue of April, 1916, the cultivation of the root should result in very satisfactory returns. Chicory thrives well in the Cairns district.

THE BEST SOIL FOR CITRUS TREES.

"G.N.," Sarina—

The best soil for successful citrus culture is a deep sandy loam with a gravelly or shaly subsoil. The loamy soil should be of a reddish, brownish, or chocolate colour, fairly rich in humus, or organic matter, but not necessarily very rich in plant food. The mechanical condition of the soil is of equal, or even greater, importance than extreme fertility. The subsoil, also, is of greater importance than the soil itself. It should be thoroughly friable, of a red or brownish colour—never yellow, blue, or greyish-white—free from clay, and porous. If the subsoil is of the latter colours, it is a sign that the land is sour, and is impregnated with unoxidised salts of iron, which are detrimental to the growth of citrus trees. Such subsoils require draining and aerating.

THE RABBIT IN AUSTRALIA.

"INQUIRER"—

The rabbit was imported into Queensland some years ago, about the year 1865. In 1868 we obtained a dozen rabbits, and gave them their liberty at Oxley Creek, where they soon made burrows, but for some reason or other, snakes and iguanas probably, they never increased, and finally vanished altogether. The "Brisbane Courier" (May, 1865) stated that "a large and very valuable consignment of rabbits of various new and excellent breeds, from the Royal Society of Brussels, arrived in March last, and are now, after recovery from the voyage, in excellent condition. The Council (of the Acclimatisation Society ?) propose, in the spring of the year, to turn loose one or perhaps two lots of the silver grey breed, of which, by that time, the society will have a larger number than can conveniently or profitably be kept in confinement. The other varieties promise to breed freely, and it is expected that during the next three or four months surplus stock can be sold to cover the cost of their introduction to the colony." It would to-day be more to the point if the State could finance the cost of freeing the country of the rabbits, and so put an end to the immense outlay in the West on rabbit fencing. The rabbit was never indigenous in Australia.

THERMOMETER READING.

CENTIGRADE, FAHRENHEIT, REAUMUR.

"CENTIGRADE," Cairns—

To reduce Centigrade to Fahrenheit: $\frac{\text{Cent. degrees} \times 9}{5} + 32 =$ Fahrenheit.

To reduce Fahrenheit to Centigrade: $\frac{\text{Fahr. degree} - 32 \times 5}{9} =$ Centigrade.

To reduce Réaumur to Fahrenheit: $\frac{\text{Reau. degrees} \times 9}{4} + 32 =$ Fahrenheit.

To reduce Fahrenheit to Réaumur: $\frac{\text{Fahr. degrees} - 32 \times 4}{9} =$ Réaumur.

To reduce Centigrade to Réaumur: $\frac{\text{Cent. degrees} \times 4}{5} =$ Réaumur.

To reduce Réaumur to Centigrade: $\frac{\text{Reau. degrees} \times 5}{4} =$ Centigrade.

Because 9 Fahr. = 5 Centigrade = 4 Réaumur.

TO FIND THE TIME A BODY WILL TAKE IN FALLING FROM A HEIGHT OF 2,000 FEET.

AEROPLANE, ENOGGERA.—Divide the height by 16·1, and extract the square root of the result. If an aviator falls from his machine when at a height of 2,000 ft., then $\frac{2{,}000}{16{\cdot}1} = 124{\cdot}223$ $\sqrt{124{\cdot}223} = 11{\cdot}2$ seconds time taken to reach the ground.

NOMENCLATURE AND NOTES ON GRASSES.

"BRISTOLIAN" Fairfield, Oakey—

Mr. H. C. Quodling, Director of Agriculture, supplies the following answers to your questions:—

1. Sudan Grass, like other sorghums, will give a second crop under favourable circumstances. It is not a suitable grass for grazing off, and is more adapted for hay and ensilage.

2. Feterita belongs to the sorghum family, and should not be fed in an immature state to cattle.

3. No, unless fed in excess quantities. Stock should be accustomed gradually to any change of diet.

4. With some seedsmen, Imphee and Planter's Friend are synonymous. Amber cane seed and Planter's Friend seed are very similar in appearance. When growing, the former has a more branching type of seed panicle, whereas the "head" of the latter is of a more bunchy character. Sorghum Saccharatum has a larger seed than either of the above, and possesses a black, shiny covering almost completely covering

the seed itself. Sorghums are so readily cross-fertilised that there is a noticeable lack of purity to type to be met with in ordinary commercial crops.

5. Sorghum Saccharatum has a branching seed panicle also. Sorghum poisoning is generally so rapid in its action that preventive measures cannot be applied in time to save an animal's life. However, it is considered by some authorities that if any food of this character is given to animals (cattle and pigs), molasses should be fed in conjunction, as the sugar in the molasses checks decomposition. Molasses is regarded as a good antidote for sorghum poisoning in cattle provided the remedy is applied in time. The Government Veterinary Surgeon states that the most satisfactory way of dealing with sorghum poisoning is to use the trochar where there are signs of "hoven," and to give the animal molasses and follow up in an hour's time with stimulants, viz., one wineglass full of turpentine to one bottle of raw linseed oil.

LIMES.

ORCHARDIST, Woombye—

The value of the lime fruit is not appreciated apparently in Australia. In a Bulletin of the Department of Agriculture, Trinidad and Tobago, Vol. XV., we find the following notes on this fruit:—

The yield per acre on an established plantation may be averaged at 24,000 lb. A barrel (160 lb.) of limes gives about 7½ gallons of juice. The following table shows the relative yield in lemon and lime cultivation:—

	Lemons. lb. per acre.	Limes. lb. per acre.
Yield of fruit	27,460 ..	24,000
Yield of juice	10,560 ..	11,550
Containing—		
Citric acid	634 ..	914
Oils	88 ..	65 { 19 / 46

These figures indicate that the yield of fruit per acre in the case of lemons is greater than the yield of limes, taking four lemons to the lb.; but the yield of juice and citric acid is considerably less. The amount of oil yielded, however, is greater in the case of the lemon. The average lemon crop per acre is 110,000 fruits, and if there are 190 trees per acre, this gives a yield per tree of about 580 lemons. The lemon may be regarded as yielding 634 lb. of citric acid per acre against 914 lb. in the case of limes. For essential oils, the figures are 88 lb. and 65 lb. respectively.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY, 1916.

Article.		MAY. Prices.
Bacon	lb.	1s. 4½d.
Barley	bush.	4s. 6d.
Bran	ton	£6 15s.
Broom Millet	"	£37
Butter	cwt.	140s.
Chaff, Mixed	ton	£7
Chaff, Oaten	"	£6
Chaff, Lucerne	"	£6 to £8
Chaff, Wheaten	"	£5
Cheese	lb.	9½d. to 9¾d.
Flour	ton	£12 5s.
Hams	lb.	1s. 4d. to 1s. 5d.
Hay, Oaten	ton	£3 5s.
Hay, Lucerne	"	£5 10s.
Honey	lb.	6½d. to 8d.
Maize	bush.	4s. 8d. to 4s. 10d.
Oats	"	3s. 6d. to 3s. 11d.
Onions	ton	£6
Peanuts	lb.	2½d. to 4d.
Pollard	ton	£6 15s.
Potatoes	"	£7 10s. to £10 10s.
Potatoes (Sweet)	cwt.	£6 to £7 10s.
Pumpkins	ton	£2 5s.
Eggs	doz.	1s. 10d. to 2s. 11d.
Fowls	pair	4s. 7d. to 7s. 9d.
Ducks, English	"	4s. to 4s. 6d.
Ducks, Muscovy	"	6s. 6d. to 7s. 6d.
Geese	"	6s. 6d. to 8s. 6d.
Turkeys (Hens)	"	9s. to 10s.
Turkeys (Gobblers)	"	13s. to 20s.
Wheat	bush.	5s. 6d. to 6s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	2s. to 4s.
Beans, per sugar bag	2s. to 3s. 6d.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	1s. to 1s. 3d.
Chocos, per quarter-case	1s. 6d. to 2s.
Cucumbers, per dozen	1s. to 1s. 6d.
Custard Marrows, per dozen	1s. to 2s.
Vegetable Marrows, per dozen	1s. to 2s.
Lettuce, per dozen	9d. to 1s.
Peas, per sugar bag	3s. 6d. to 5s. 6d.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Sweet Potatoes, per cwt.	6s. 3d. to 7s. 1d.
Table Pumpkins, per dozen	2s. to 5s. 6d.
Tomatoes, per quarter-case	2s. 6d. to 4s.
Turnips, per dozen bunches	8d. to 1s.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Queensland), per bunch	9s. to 11s.
Bananas (Fiji), per bunch	14s. to 18s.
Bananas (G.M.), per bunch	15s. to 20s.
Custard Apples, per tray	6s. to 7s.
Mandarins, per case	...
Mangoes, per case	
Oranges (Navel), per case	12s. to 18s.
Oranges (other), per case	12s. to 14s.
Passion Fruit, per half-bushel case	7s. to 7s. 6d.
Lemons (Local), per bushel case	13s. to 14s.
Papaw Apples, per double-case	9s. to 11s.
Persimmons, per half-case	...
Pineapples (Queens), per double-case	12s. to 14s.
Pineapples (Ripleys), per double-case	10s. to 12s.
Pineapples (Common), per double-case	6s. to 9s.
Tomatoes, per quarter-case	3s. to 5s.
Cucumbers, per case	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	MAY. Prices.
Apples, American, per case	6s. to 9s.
Apples, Cooking, per quarter-case	6s. to 8s. 3d.
Apricots, per quarter-case	...
Bananas (Cavendish), per dozen	1½d. to 6d.
Bananas (Sugar), per dozen	2d. to 4d.
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	3s. to 4s.
Granadillas	...
Lemons (Lisbon), per case	4s. to 8s 6d.
Lemons, per case	10s. to 13s.
Limes, per quarter-case	...
Mandarins (Local), per half-case	6s. to 11s. 6d.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges (American, Navel), per case	25s.
Oranges, (Local, Navel), per case	6s. to 8s. 6d.
Oranges (other), per case	5s. to 5s. 9d.
Papaw Apples, per quarter-case	1s. 6d. to 2s. 6d.
Passion Fruit, per quarter-case	6s. to 7s.
Peaches, per case	9s. to 9s. 6d.
Pears, per half-bushel case	7s. to 10s.
Peanuts, per pound	2½d. to 4d.
Persimmons, per quarter-case	...
Plums, per half-bushel case	4s.
Pineapples (Ripleys), per dozen	3s. to 6s. 6d.
Pineapples (Rough), per dozen	1s. to 3s 6d.
Pineapples (Smooth), per dozen	1s. 6d. to 3s. 6d.
Quinces, per case	3s. 6d. to 6s.
Rockmelons, per dozen	...
Rosellas, per sugar bag	1s. 3d. to 2s. 6d.
Strawberries, per dozen pint boxes	
Tomatoes, per quarter-case	1s. 9d. to 4s. 6d.
Piemelons	...
Watermelons, per dozen	...

TOP PRICES, ENOGGERA YARDS, APRIL, 1916.

Animal	APRIL. Prices.
Bullocks	£16 12s 6d. to £21 12s. 6d.
Bullocks (Single)	...
Cows	£10 2s 6d. to £13 17s. 6d.
Merino Wethers	39s. 6d.
Crossbred Wethers	41s. 6d.
Merino Ewes	27s. 6d.
Crossbred Ewes	37s.
Lambs	31s.
Pigs (Porkers)	76s.
Pigs (Slips)	...

LONDON QUOTATIONS.

London, May 6.—The market for frozen rabbits is quiet, and prices are unchanged.

The Liverpool quotation for middling American cotton, May-June shipment, is 7·87½d. per lb.

Jute, April-May shipment, from Calcutta, £32 15s.

The hemp market is quiet. New Zealand high point, fair, May-July shipment, £47 10s.

Rubber, fine hard Para, 2s. 10d. per lb.; plantation, first latex crepe, 2s. 9¾d.; smoked sheet, 2s. 8¾d.

Raw linseed oil, spot pipes, £38 per ton.

The only quotation for sisal hemp is for British East African. Recently arrived parcels sold at £55 to £57.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1916.	April, 1915.
North Coast.	In.		In.	In.
Atherton	4·34	15	2·26	0·59
Cairns	11·99	34	6·38	3·44
Cardwell	10·05	44	4·65	4·33
Cooktown	9·48	40	9·36	7·73
Herberton	4·12	29	2·76	0·32
Ingham	8·86	24	4·22	3·81
Innisfail	22·15	35	19·83	9·15
Mossman	16·78	5	8·57	2·48
Townsville	3·81	45	0·05	0·62
Central Coast.				
Ayr	2·85	29	0·26	0·48
Bowen	3·12	45	0·96	0·69
Charters Towers ..	1·77	31	1·71	0·67
Mackay	6·90	45	5·98	2·10
Proserpine . ..	6·56	13	1·11	4·12
St. Lawrence ...	2·83	45	3·05	0·06
South Coast.				
Biggenden	1·73	14	1·75	0·65
Bundaberg	2·78	33	3·96	0·44
Brisbane	3·70	65	8·95	2·41
Childers	2·33	21	3·56	0·11
Crohamhurst ...	5·22	22	16·63	1·30
Esk	2·60	29	6·91	1·91
Gayndah	1·29	45	2·79	1·36
Gympie	3·13	46	2·80	0·58
Glasshouse M'tains	4·52	6	13·77	3·19
Kilkivan	2·08	37	3·41	0·86
Maryborough ...	3·27	45	4·97	1·01
South Coast—continued:	In.		In.	In.
Nambour	4·38	20	9·27	4·17
Nanango	1·80	34	6·36	0·96
Rockhampton ...	2·27	29	2·79	0·02
Woodford	3·90	29	14·45	2·15
Darling Downs.				
Dalby	1·29	46	1·81	0·44
Emu Vale	1·21	17	2·34	0·79
Jimbour	1·48	24	3·31	1·16
Miles	1·46	31	2·19	0·96
Stanthorpe ...	1·75	43	3·97	2·09
Toowoomba ...	2·44	44	7·92	1·00
Warwick	1·35	29	2·77	0·72
Maranoa.				
Roma	1·31	42	1·78	0·98
State Farms, &c.				
Bungeworgorai ...	0·96	3	0·65	0·50
Gatton College ...	1·84	14	4·83	1·38
Gindie	1·42	13	1·19	0·08
Hermitage ...	1·32	7	3·25	0·80
Kairi	3·26	3	5·32	0·82
Kamerunga Nurs'y	12·06	27	7·48	3·52
Sugar Experiment Station, Mackay	5·07	16	8·03	2·57
Warren	..	..	1·03	Nil

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April this year and for the same period of 1915, having been compiled from telegraphic reports are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE SECOND FOUR MONTHS OF 1916.

Date.	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·40	5·3	6·30	5·18
2	6·14	5·15	6·31	5·0	6·40	5·4	6·30	5·18
3	6 15	5·14	6 32	5 0	6·40	5·4	6·29	5·19
4	6 15	5·13	6·32	5 0	6·40	5·4	6·29	5·20
5	6·16	5·13	6 33	5·0	6·40	5·4	6·28	5·20
6	6·17	5·12	6·33	5 0	6·40	5·5	6·28	5·20
7	6·17	5·12	6·34	5·0	6·40	5·5	6 27	5·21
8	6 18	5·11	6·34	4 59	6·40	5·6	6 26	5·21
9	6·18	5·10	6·35	4·59	6·39	5 6	6 25	5·22
10	6·19	5·10	6·35	4·59	6 39	5·7	6 24	5·23
11	6·19	5·9	6 35	4·59	6 39	5·7	6·23	5·23
12	6·20	5·9	6·35	4·59	6·39	5·7	6 22	5·24
13	6·20	5·8	6·36	4·59	6 39	5·8	6·21	5·25
14	6·21	5·8	6·36	4·59	6·39	5·8	6 20	5·25
15	6·21	5·7	6·36	4·59	6 39	5·9	6·19	5·26
16	6·22	5·7	6·37	4·59	6 38	5·9	6·18	5·26
17	6·22	5·6	6·37	4·59	6·38	5·10	6·17	5·26
18	6·23	5·6	6·38	5·0	6·37	5·10	6·17	5·27
19	6·24	5·5	6·38	5 0	6·37	5·11	6·16	5·27
20	6·24	5·5	6 38	5·0	6 36	5·12	6 15	5 28
21	6·25	5·4	6·38	5 0	6·36	5·12	6·14	5·28
22	6·26	5·4	6·39	5·1	6 36	5·12	6·13	5 28
23	6·26	5·3	6·39	5·1	6·35	5·13	6·12	5·29
24	6·27	5·3	6·39	5·1	6·35	5·13	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·2	6 39	5 1	6·33	5·15	6·9	5·30
27	6 28	5·1	6·40	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·40	5·2	6·32	5·16	6·7	5·31
29	6·29	5·1	6·40	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5.32
31	6·30	5·0	...	...	6·31	5·17	6·4	5·32

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

			H. M.
2 May	●	New Moon	3 29 p.m.
10 „	☾	First Quarter	6 47 „
18 „	○	Full Moon	12 11 a.m.
24 „	☽	Last Quarter	3 16 p.m.

The moon will be farthest from the earth on the 7th, and nearest on the 19th.

1 June	●	New Moon	5 37 a.m.
9 „	☾	First Quarter	9 59 „
16 „	○	Full Moon	7 42 „
22 „	☽	Last Quarter	11 16 p.m.
30 „	●	New Moon	8 13 „

The moon will be farthest from the earth on the 4th, and nearest on the 16th at midnight.

8 July	☾	First Quarter	9 55 a.m.
15 „	○	Full Moon	2 40 „
22 „	☽	Last Quarter	9 33 „
30 „	●	New Moon	12 15 p.m.

The moon will be nearest to the earth on the 15th, and farthest from it on the 28th.

7 Aug.	☾	First Quarter	5 6 a.m.
13 „	○	Full Moon	10 0 p.m.
21 „	☽	Last Quarter	10 52 „
29 „	●	New Moon	3 25 a.m.

The moon will be nearest to the earth on the 12th, and farthest from it on the 25th.

A partial eclipse of the moon will occur on 15th July at 2 30 p.m., when the moon will be below the horizon in Australia.

An eclipse of the sun will take place on 30th July. It will be partial only in Queensland but annular, or leaving the edge of the sun visible as a magnificent golden ring at Adelaide, and in a line across the south-west of Australia.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane at this time of the year.

At Roma the times of sunrise and sunset during May, June, July, and to the middle of August may be roughly arrived at by adding 20 minutes to those given above for Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is then practically checked, and the young lucerne plants will, therefore, not be checked by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time weeds once more appear it will be well able to hold its own against them. From 10 to 12 lb. of seed drilled, or 15 to 16 lb. broadcast, will be sufficient for an acre. This is also the time to prepare the land for many field crops, such as potatoes, maize, oats, and barley for green fodder: also, rye, vetches, tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes during this month in any districts liable to late frosts or in low-lying ground. Under such conditions, it is far better to wait until well into the following month. The greatest loss in potatoes and sugar-cane has been, on more than one occasion, experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and turmeric unearthed.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait until the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Sow Guada beans (snake gourd) at the end of September.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolor, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

Orchard Notes for July.

THE SOUTHERN COAST DISTRICTS.

The notes for the month of June apply to July as well. The first crop of strawberries will be ripening during the month, though extra early fruit is often obtained in June, and sometimes as early as May, under especially favourable conditions. Look out for leaf-blight, and spray for same with Bordeaux mixture, also watch for the first signs of the grey mould that attacks the fruit, and spray with the sulphide of soda wash. The larvæ of the cockchafer, that eats the roots of strawberries, should be looked for, and destroyed whenever found. Pruning of citrus and other fruit trees may be continued; also, the spraying with lime and sulphur. Where the ringing borer, that either attacks the main trunks or the branches at or near where they form the head of the tree, is present, the main stems and trunks should either be painted or sprayed with the lime and sulphur wash during the month, as the mature beetles that lay the eggs that eventually turn to the borers sometimes make their appearance during the month, and unless the trees are protected by the wash they lay the eggs, which hatch out in due course and do a lot of damage. Keep the orchard clean, so that when the spring growth takes place the trees may be in good condition. There is usually a heavy winter crop of pineapples ripening during this and the following month, particularly of smooth leaves. See that any conspicuous fruits are protected by a wisp of grass, as they are injured not only by frost but by cold westerly winds.

THE TROPICAL COAST DISTRICTS.

See the instructions given for the month of June. Keep the orchards clean and well worked. Prune and spray where necessary.

THE SOUTHERN AND CENTRAL TABLELANDS.

Where pruning of deciduous trees has not been completed, do so this month. It is not advisable to leave this work too late in the season, as the earlier the pruning is done after the sap is down the better the buds develop—both fruit buds and wood buds; thus securing a good blossoming and a good growth of wood the following spring.

Planting can be continued during the month; if possible, it should be finished this month, for though trees can be set out during August, if a dry spell comes they will suffer, when the earlier planted trees, which have had a longer time to become established, will do all right—provided, of course, that the land has been properly prepared prior to planting, and that it is kept in good order by systematic cultivation subsequent to planting.

Do not neglect to cut back hard when planting, as the failure to do so will result in a weakly growth.

As soon as the pruning is completed, the orchards should get their winter spraying with the sulphur limewash, and either with or without salt, as may be wished. See that this spraying is thoroughly carried out, and that every part of the tree is reached, as it is the main treatment during the year for San José and other scale insects, as well as being the best time to spray for all kinds of canker, bark-rot, moss, lichens, &c.

Where the orchard has not been ploughed, get this done as soon as the pruning and spraying are through, so as to have the land in good order for the spring cultivations. See that the work is well done, and remember that the best way to provide against dry spells is to keep moisture in the soil once you have got it there, and this can only be done by thorough and deep working of the soil.

When obtaining trees for planting, see that they are on good roots, and that they are free from all pests, as it is easier to prevent the introduction of pests of all sorts than to eradicate them once they have become established. Only select those varieties that are of proved merit in your district; do not plant every kind of tree that you see listed in a nurseryman's catalogue, as many of them are unsuited to our climate. The pruning of grape vines may be carried out in all parts of the tablelands other than the Stanthorpe district, where it is advisable to leave this work as long as possible, owing to the danger of spring frosts.

Where grape vines have been well started and properly pruned from year to year, this work is simple; but where the vines have become covered with long straggling spurs, and are generally very unsightly, the best plan is to cut them hard back, so as to cause them to throw out good strong shoots near the main stem. These shoots can be laid down in the place of the old wood in following seasons, and the whole bearing portion of the vine will be thus renewed.

Where vineyards have been pruned, the prunings should be gathered and burnt, and the land should receive a good ploughing.

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